SEPTEMBER 27, 1945

American Machinist

Peacetime Products Return

RECONVERTED ASSEMBLY LINES REPLACE WAR PRODUCTION

SURGERY ON A PRODUCTION LINE

CUT OUT *your* wasteful operations with Heald Automatic Sizing · Automatic Loading · Automatic Cycles

As you swing from production ear-marked for war into production price-marked for peace—you will have to cut corners at every turn. That means eliminating hand operations such as loading and sizing that can be done *automatically*. And these are the proven ways to get more out of every man-hour of production time which Heald offers you.

In internal grinding, either Size-Matic or Gage-Matic Internals make it unnecessary for the operator to stop and gage the work. With Bore-Matics, maintenance of accuracy throughout long runs is inherent in this method of precision finishing. Then, think what manual loading may be costing you. Heald methods of automatic loading are available in No. 81 Centerless Internals and for Bore-Matics, too, on some types of work—eliminating such operations as inserting the work, clamping, unclamping and removing. And for both boring and grinding operations, Heald provides fully automatic cycles.

Now is the time to put the finger on wasteful operations in your plant. The Heald three-way principle of Automatic Operation offers a profitable solution to your problems—whether for miscellaneous runs or high volume production. Why not let a Heald Engineer come in and look over blueprints of your work?

THE HEALD MACHINE COMPANY
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More Precision · Less Cost **HEALD**

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American Machinist Chips

Paper Heaven . . . While most of you men have been suffering due to shortages of various critical materials, in our own little way we have been lamenting restrictions on paper, which have forced us to establish a waiting list of subscribers and have gradually reduced the weight, or thickness, of paper used in this magazine.

With high kicking of heels and a sigh of relief we are pleased to say that all restrictions have been removed from magazine publishers and pretty soon we hope to be able to get back into normal stride.

This means that some 1700 would-be subscribers who have been patiently waiting on our waiting list are being accommodated as quickly as they can be "processed." By the time you read this we expect that over 26,000 metal-working men will be subscribing to each issue of *American Machinist*.

This paper-free world means, too, that as soon as it is available, a better, heavier grade of stock will be used in printing *American Machinist* and reading it will be that much easier and more pleasant.

Milling Text . . . From time to time in this column we have commented on the series of very fine articles by M. Martellotti, Research Engineer of The Cincinnati Milling Machine Company. Titled "Milling Cutters and How to Use Them," we have published this series of 12 installments in a 52-page booklet which we believe represents one of the most up-to-date "courses" on milling practices that you will find anywhere today.

We have a goodly supply of these booklets in stock and they are being offered for sale at 50c each—somewhat less in quantities. If you can use any—and if you have milling done in your plant you can—please use the coupon below.

In This Issue . . . Several timely reconversion articles should interest you. One is the story of a typical changeover, involving plant clearance, by Amco in Detroit. This article describes how the firm prepared their own work sheets to handle the situation . . . the data from which were later transferred to official government sheets with a minimum of trouble. The other reconversion article tells about all the equipment which must be cleared out of Detroit before plants in that area can reconvert. It is reported that automotive plants will be able to use only 15% of the war production equipment they have had installed.

The final of two articles on industrial expansion in Latin America gives further survey information to bolster the conclusion that our neighbors to the South represent a substantial postwar market for American manufacturers of machine tools. This authoritative survey presents factual data on Latin America's enthusiastic hopes for a profitable industrial future.

The sixth article in all-encompassing series on oxyacetylene cutting by Dr. G. V. Slottman of the Air Reduction Sales Company discusses the separate controls necessary in the precision cutting of steel. Tables provide data on high-speed and high-quality cutting, and list conditions for cutting when using the recently-developed divergent-nozzle cutting tip.

Reconversion Inventory . . . Allis Chalmers has been getting out a very interesting series of folders describing the check lists they have for helping metal-working plants take inventories of installed centrifugal pumps, V-belts and electric motors.

The one we happen to have at hand, on pumps, not only reproduces the check list—copies of which are offered free—but includes detailed instructions on how to inventory this equipment. A very constructive and practical way to help Metal-Working size-up itself and prepare for postwar production.

Old Patriot . . . . Yeoman 2/C Henry Unger, USNR, writes us from Jacksonville, Florida, of the bright wartime record of French-born Joseph Alexander Paulette . . . machinist at the Merrill-Stevens Drydock and Repair Company.

Mr. Paulette, a mere 81 years old, hasn't missed a day of work since Pearl Harbor. Says the peppery old man, "I was too old to fight. So turning out a day's work was the least I could do to help win the war. I couldn't shoot a gun but I could run a boring mill and I know some of the stuff I have turned out has smashed a few Nazis and Japs."

Paulette's chief hobbies, according to our correspondent, are fishing and reading. Now that V-J Day is here we wish the sturdy gentleman many happy hours of relaxation.

American Machinist, 330 W. 42 St., New York 18, N. Y.

Please send me ( ) copies of the 52-page booklet "Milling Cutters and How to Use Them" by M. Martellotti of Cincinnati Milling Machine Company. I enclose 50c each, or $....., for my copies.

Name .....

Position .....

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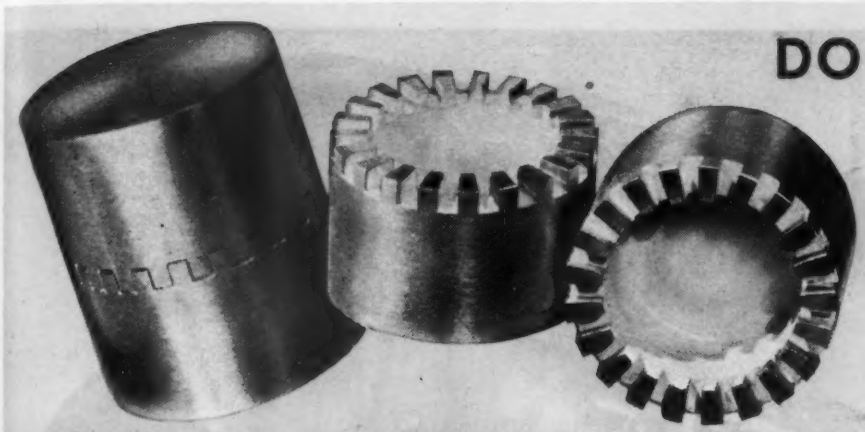


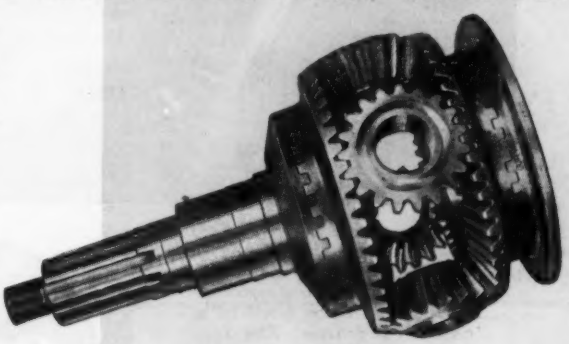
DO YOU NEED A PRECISION CONNECTION FOR COUPLED PARTS?

USE GLEASON CURVIC* COUPLINGS

A precision connection of a new type is now available for coupling together a wide variety of parts. These couplings have teeth of radial direction and parallel depth, cut and ground into the faces of the connected parts.

Gleason Curvic Couplings bring to the field of coupled parts the same high degree of accuracy, load capacity, and fast rate of production obtained in curved-tooth bevel gears, because the same Gleason cutting and grinding machines are used for both.

The Curvic design provides a precision, light, compact, and self-contained connection in which the teeth both center and drive. The accuracy and uniformity are such that complete interchangeability is possible, facilitating manufacture and assembly of the coupled parts.



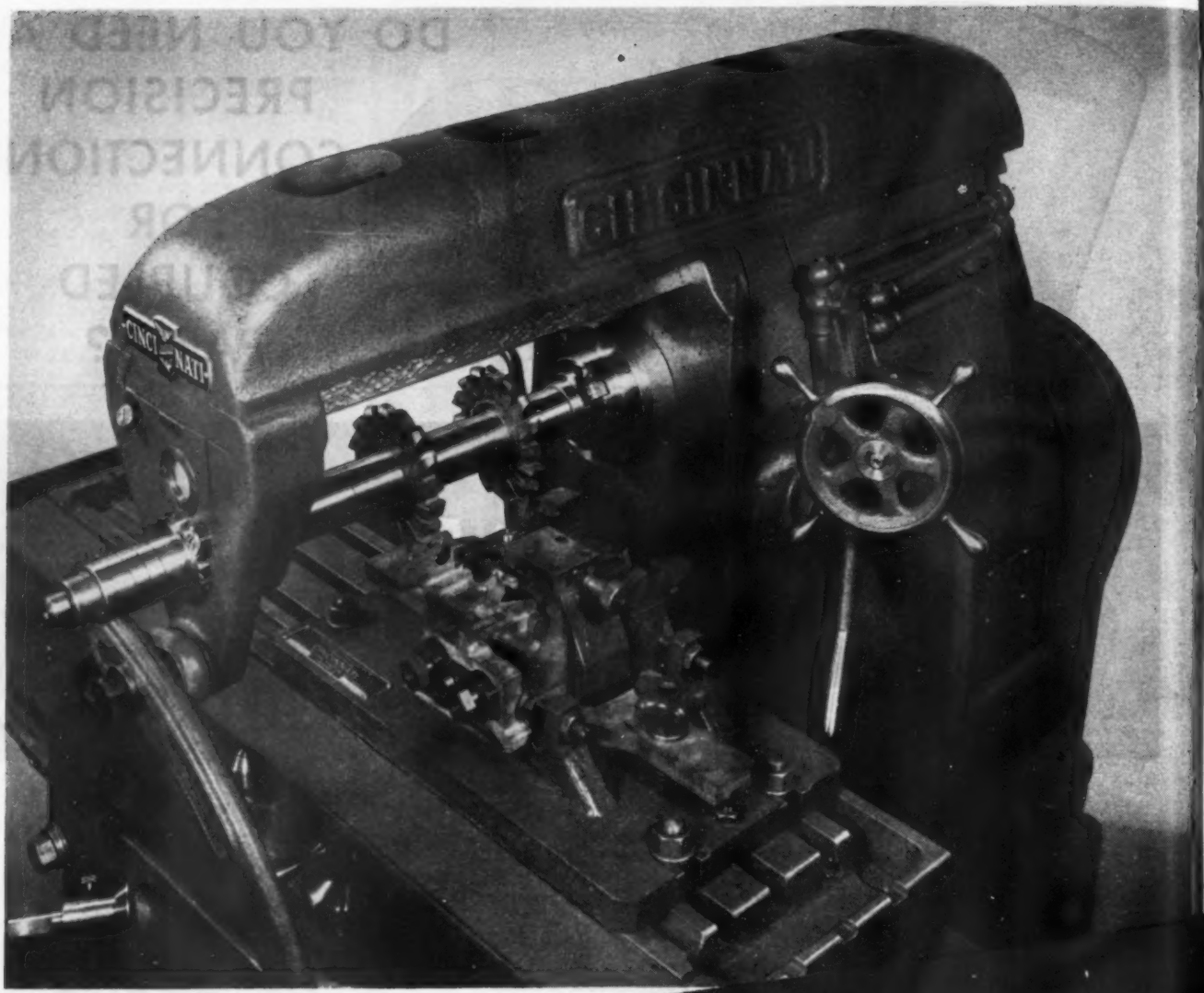
GLEASON CURVIC COUPLINGS **of the semi-universal type allow a slight angular mis-alignment of shafts (2° maximum) together with axial freedom. Used here to connect a planetary Zerol bevel reduction unit to a marine engine and transmission.**

GLEASON Works
Builders of BEVEL GEAR MACHINERY FOR OVER EIGHTY YEARS

Investigate the advantages of Gleason Curvic Couplings for your clutch and coupling applications. Write for descriptive brochure.

*TRADE MARK

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U.S.A.



CINCINNATI *No. 1-18 Plain Automatic, milling notches in lugs on both ends of a cast iron frame. The fixture has two stations. A 5/8" slot in one end of the part is milled in the forward station, and a 1/2" slot in the other end of the part is milled in the rear station. One part is completed every pass.*

Zip - AND WORK IS UP

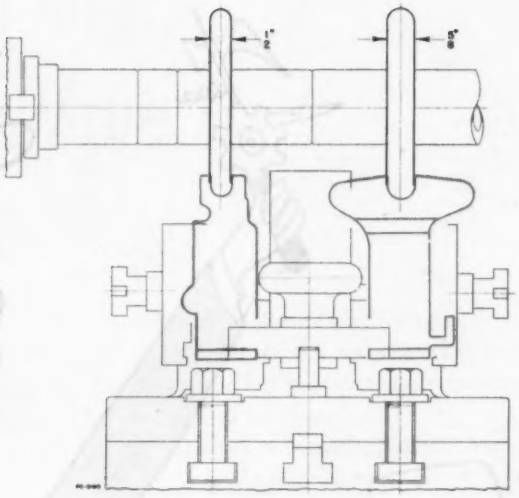
ON CINCINNATI No.

CINCINNATI

THE CINCINNATI MI

MILLING MACHINES

When you advance the work to the cutters at 300″ per minute, you don't waste much time cutting air. Fast table traverse with rapid automatic cycles helps to make the CINCINNATI 1-18 Miller an unusually high production machine. Other reasons are: 1) Sturdy construction. 2) Takes heavy cuts. 3) No saddle, which means less vibration. 4) High spindle speeds up to 1500 rpm. 5) Table feeds up to 60″ per minute. 6) Easy to set up and operate. ¶ The CINCINNATI 1-18 is fast, accurate and economical for milling small work pieces for typewriters, cash registers, tabulating and business machines, hand tools, etc. Investigate the use of this versatile machine for your milling operations. Cincinnati Application Engineers will be glad to talk it over with you.



Name of part: Frame
Material: Cast iron
Operation: Mill notches in lugs
Speed: 103 feet per minute
Feed: 7″ per minute
Depth of cut: From Solid
Production: 36 parts per hour

S UP TO THE CUTTER

No. 1-18 MILLERS!

CINCINNATI *1-18 Plain Automatic Milling Machine. Complete specifications may be obtained by writing for Catalog M-848. For a brief description of this machine, look in Sweet's Catalog File.*

TI MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

NES

BROACHING MACHINES • CUTTER SHARPENING MACHINES

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U.S.A.

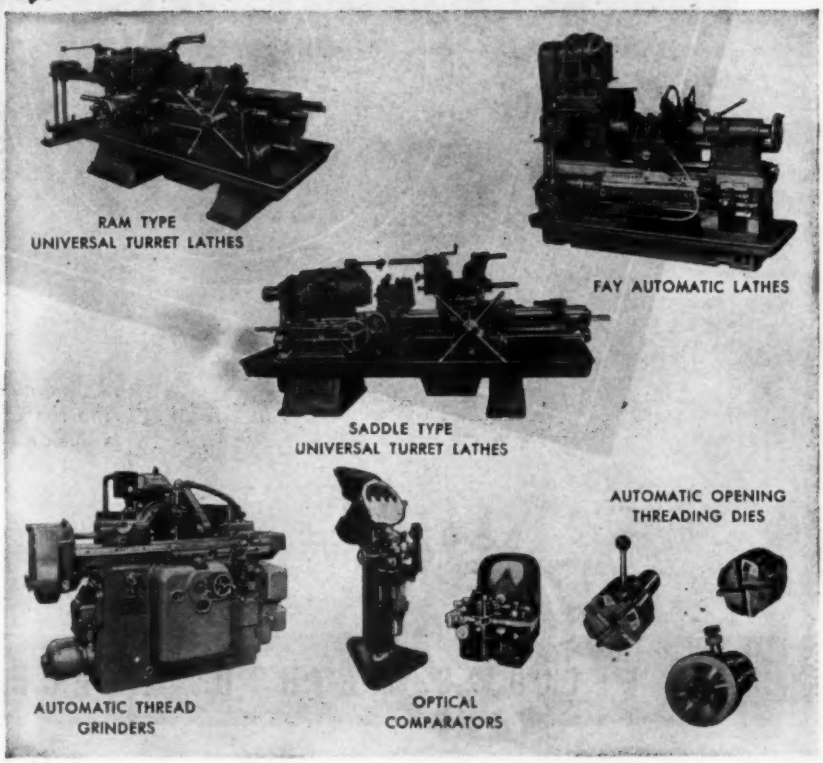
When the mad rush begins... competition will be terrific.

Wages will stay high — competition will be terrific. To remain in business and maintain full employment, manufacturers must use the most efficient machine tools obtainable. Scrap the old machines and cut production costs.

There's the case of a manufacturer whose purchase of a Jones & Lamson Turret Lathe nets him a saving of $700 to $1000 per month on a single part. This is but one of many similar cases.

Whether you buy War Surplus machines or new machines to replace your obsolete equipment, be sure that they can transmit *the horsepower and have the rigidity to use the carbide cutting tools which provide the fastest known method of metal turning today.*

Jones & Lamson machines *can* transmit the horsepower and *have* the rigidity to take full advantage of these tools. Send for our book, "Welcome to You and Your Problems." Or, better yet, ask for one of our engineers to assist you in making the most profitable investment.

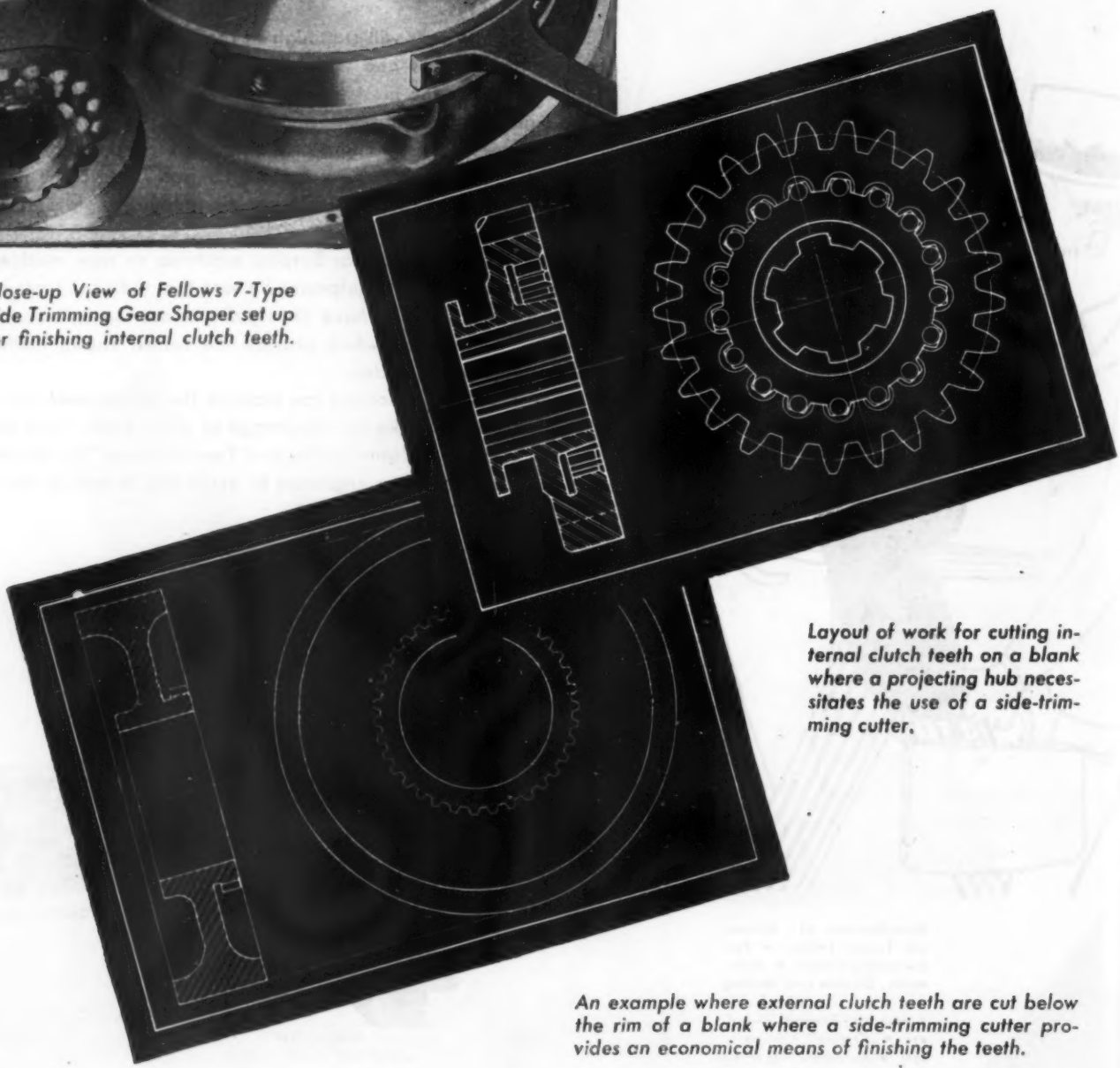


Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

J&L

SIDE-TRIMMING CUTS TEETH

Close-up View of Fellows 7-Type Side Trimming Gear Shaper set up for finishing internal clutch teeth.



Layout of work for cutting internal clutch teeth on a blank where a projecting hub necessitates the use of a side-trimming cutter.

An example where external clutch teeth are cut below the rim of a blank where a side-trimming cutter provides an economical means of finishing the teeth.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

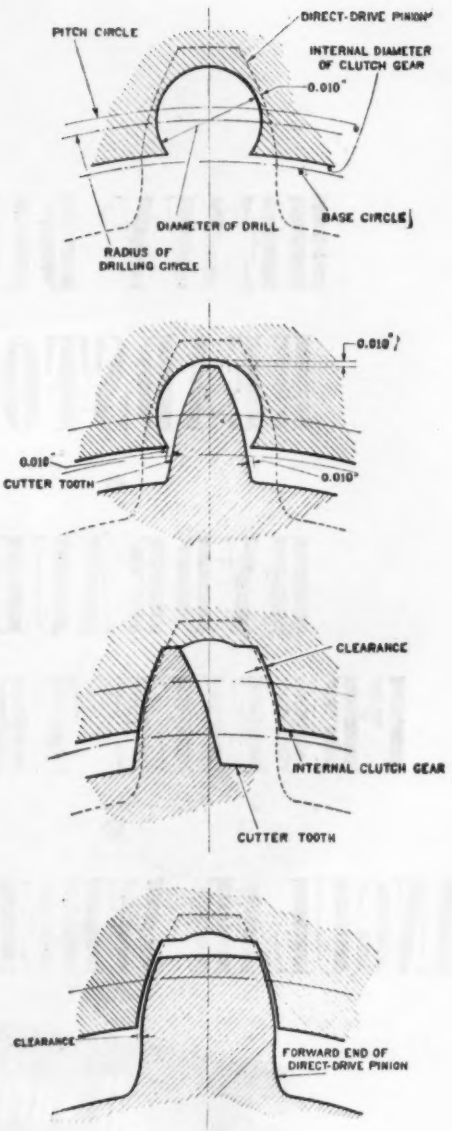
GEAR SHAPER IN *close quarters*

Compact design requirements sometimes dictate the need for cutting precision external or internal gear or clutch teeth close to a projecting hub or inside an extended rim, where conventional types of cutters and machines cannot be employed.

To accomplish such work, Fellows makes a Side-trimming Gear Shaper and special side-trimming cutters. The cutter has the same number of teeth, which are also the same shape as the clutch teeth. The cutter teeth are made thinner than the required width of the tooth spaces, so that the cutter will enter the previously drilled holes, as illustrated.

The cutter- and work-spindles do not rotate, but an oscillating motion is imparted to the cutter-spindle, so that the cutter teeth alternately cut the corresponding sides of the teeth. This operation progresses until the tooth spaces are machined to the desired width, when the machine stops automatically.

The accompanying diagrams are indicative of the nature of such work. Our engineers will be glad to work with you in solving your gear or other related problems. Write: The Fellows Gear Shaper Company, Springfield, Vermont, or 616 Fisher Building, Detroit 2, Michigan, or 640 West Town Office Building, Chicago 12, Illinois.



Progressive steps in the cutting of internal clutch teeth on a Fellows Side-Trimming Gear Shaper.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

CINCINNATI

Angular Wheel Head on a CINCINNATI
10" x 36" Plain Hydraulic Grinding Machine

HEAVY DUTY HEADSTOCK • HYDRAULIC PROFILE TRUING • ANGULAR WHEEL HEAD

Cincinnati Application Engineers have many years of experience in improving production, finish and accuracy of precision ground parts . . . in devising equipment and methods to meet specific requirements. Three examples of their work are shown here. And they have a wide range of standard machines upon which to base their recommendations. Here is the Cincinnati line: 4" to 28" Plain Grinders (larger on special order); 12", 14", 16" and 18" Universal Grinders; Nos. 2, 3 and 4 Centerless Grinders (smaller and larger on special order), and Centerless Lapping Machines. And keep this important fact in mind—*all these machines have FILMATIC Grinding Wheel Spindle Bearings.*

¶ Consult Cincinnati Application Engineers about your precision grinding and finishing problems. They will be glad to analyze your requirements and give you the benefit of their many years' experience.

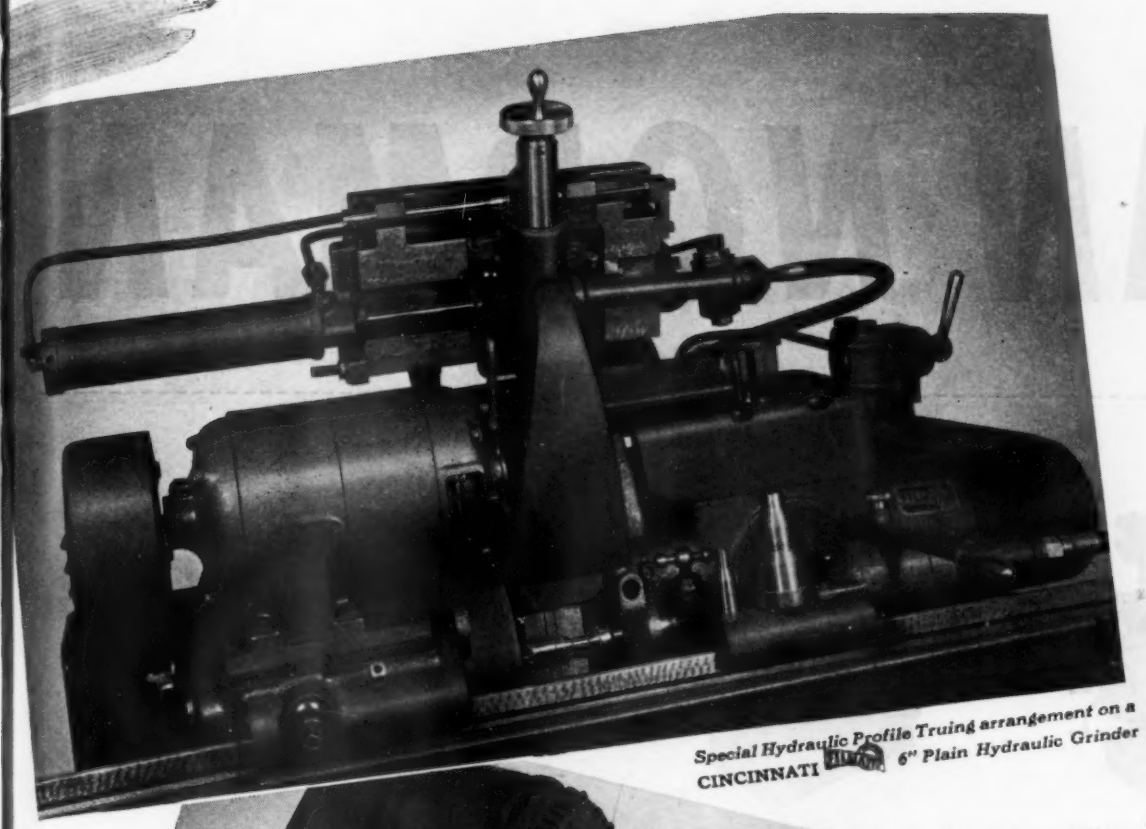
. . . all variations from standard grinding machines handled by Cincinnati Application Engineers

CINCINNATI GR

CINCIN

CENTER TYPE GRINDING MACHINES

CENTER



Special Hydraulic Profile Truing arrangement on a CINCINNATI *6" Plain Hydraulic Grinder*

Heavy Duty Headstock mounted on a CINCINNATI *Hydraulic Universal Grinding Machine*

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VAN NORMAN

HORIZONTAL MILLING—Adjusting the head to horizontal position, the operator is ready for any horizontal milling operation. Should the same work piece call for angular or vertical milling, the operator swivels the cutterhead into the desired position and takes the cut, usually without changing the work set-up.

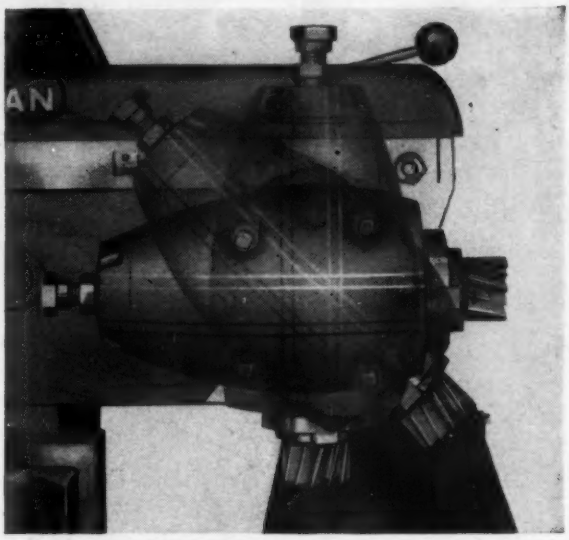
VERTICAL MILLING—Whether it's the same day or next—and the milling requirements call for the use of vertical millers—the operators of Van Norman Ram-Type Millers swivel and lock the cutterheads in the vertical position and proceed with the work. Thus the machines are in operation constantly with subsequent savings in cost.

ANGULAR MILLING—If there's an angular milling job to perform, the operator swivels and locks the cutterhead in the required position and he is ready for milling operation.

All vertical, all horizontal, all angular—or some vertical, others horizontal, etc., that's what Van Norman Ram-Type Millers give you . . . the work range of several single purpose machines *in each miller.*

RAM-TYPE MILLERS

Meet Every Milling Requirement . . . Horizontal, Vertical, Angular



Swiveling cutterhead gives operators the milling capacity of several machines in ONE.

The versatility of Van Norman Ram-Type Millers enables you to plan your work so that idle machine time can be practically eliminated—operators can be kept busy daily.

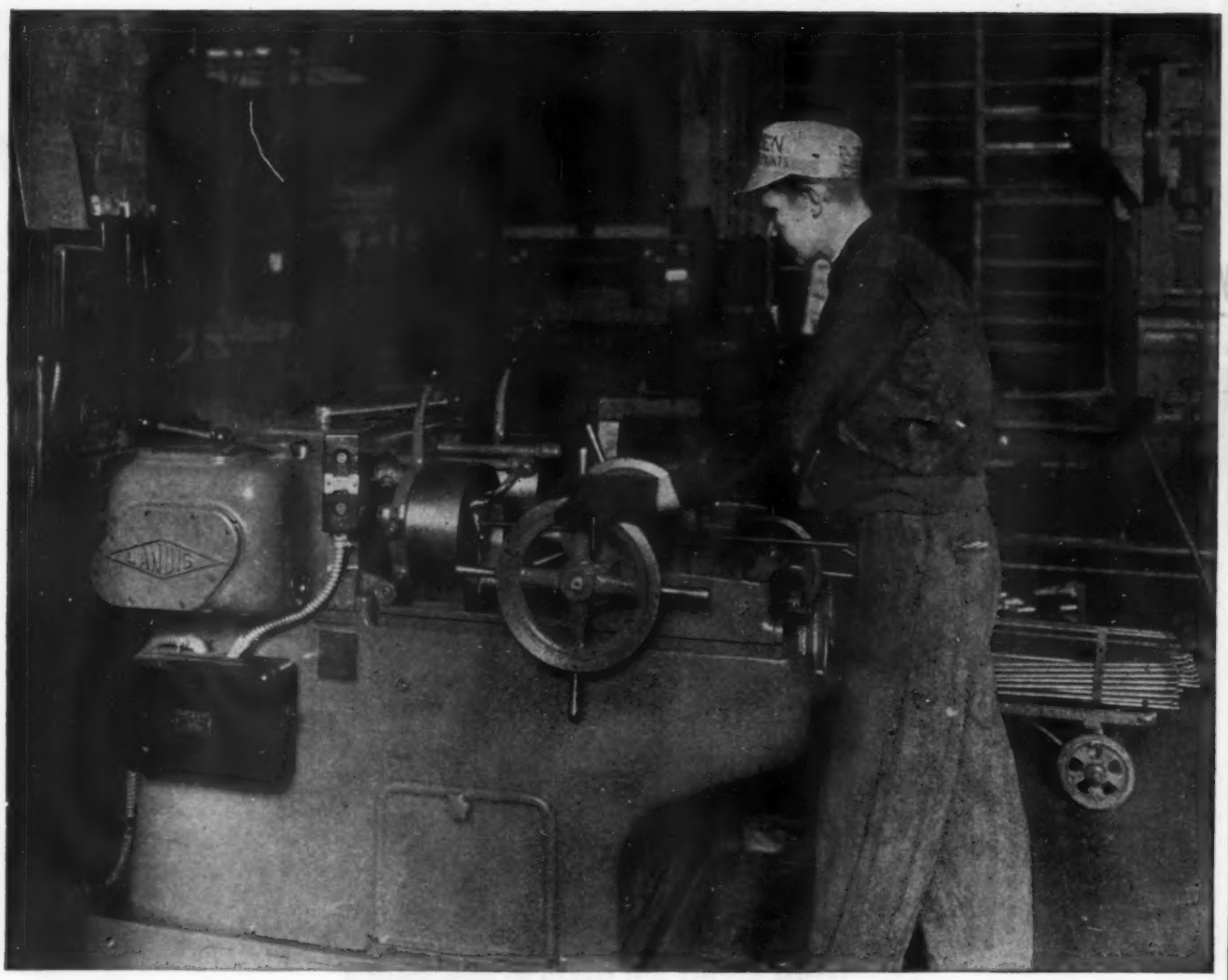
For instance, you have several Van Norman Ram-Type Millers. Each of these machines gives you the working capacity of a horizontal, angular and vertical miller. This means that no matter what type of work you have from day to day, each Van Norman Ram-Type Miller can do the job. The result is no waiting for specific machines . . . no production delays . . . increased profits from full utilization of the operators and millers. And another important advantage is that Van Norman Millers will meet post-war requirements for tool room and general purpose milling.

The adjustable cutterhead saves money and insures accurate work because most jobs can be carried through to completion without changing the work set-up. Add to this such features as movable ram, front and rear directional control of all power feeds, front and rear control of manual feeds, heavy-duty column, knee and saddle assemblies, heavy-duty arbor support, conveniently located speed selector, and you'll readily see how Van Norman Ram-Type Millers insure accuracy, save money, speed milling operations and reduce rejects. Available with plain or swiveling table. Write for complete information today.

VAN NORMAN COMPANY

Springfield 7, Massachusetts

"It pays to Van Normanize"



An All-Purpose Threading Machine . . . . . The LANDMACO

The Landmaco Threading Machine here illustrated is a general purpose machine. The thoroughly modern design, which permits quick set-up changes, makes it ideal for the short production run of tie-rods, a single rod for maintenance or a rush call for some special-threaded parts.

Its high operating speed assures unusual production figures in threading tough alloy steel jobs to close tolerances or in cutting the average commercial threads used in construction, reclamation and maintenance.

The Landmaco Threading Machine is accurate, fast, dependable and will handle all demands with a minimum of delay.

Write for Bulletin H-75

LANDIS MACHINE COMPANY

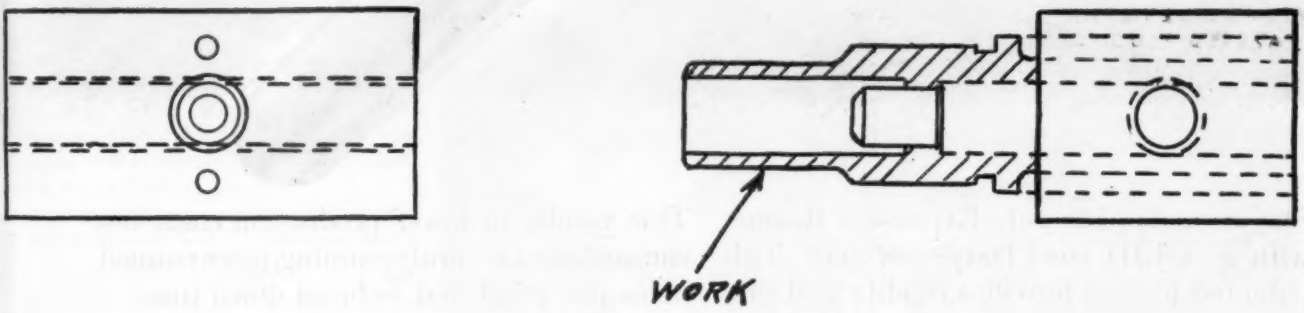
A Good Mechanic Knows and Cares For His Machine

LANDIS REG. U.S. TRADE MARK PAT. OFF. THREAD TIPS

In the Interest of Efficiency, Better Workmanship and Higher Production

SPECIAL WORK HOLDING FIXTURE FOR ¾ MACHINE

Special work holding fixtures are supplied with Landis Threading Machines for many types of operations. These fixtures are special and must be designed for the job.



Complete specifications mailed to us will bring our recommendations which may result in Higher Production and More Accurate work.

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

THE SOLID TOOL BODY
of Staples Expansion Reamers Insures PRECISION ACCURACY . . . LONGER TOOL LIFE!
TO EXPAND SIMPLY DRIVE IN THE TAPERED PLUG

Staples makes the *only* Expansion Reamer with a SOLID steel body—*not split.* This patented feature provides rigidity and precision accuracy not possible with conventional expansion reamers.

Another exclusive, patented Staples feature is the method of expansion. Simply drive in the tapered plug to obtain uniform outward expansion. Adjustment to .0001 inch accuracy is easily and quickly made.

Every Staples Expansion Reamer can be expanded several times without regrinding and without loss of accuracy in the tool. This results in lower production costs because of more accurate reaming, more reamed holes per grind and reduced down time.

The complete line of Staples Precision Carboloy Tipped Expansion Reamers and other Circular Cutting Tools is shown in the Staples Catalog. This book also contains helpful suggestions on how you can save tool costs by efficient reamer usage and reconditioning. Send for your copy today—no obligation.

Staples Tool & Engineering Company
Cincinnati 25 . . . . . Ohio

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

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GOOD THINGS AHEAD

It is reported that . . . . . .

One of the obstacles in the way of large-size home television is the cost of the necessary aspherical lenses. A new material and method makes it now possible to mold these accurately of plastic at much lower cost. *Polaroid Corp.*

get ready with CONE for tomorrow

A "plastic foam" has been developed that is semi-rigid and weighs only about one-seventh as much as cork.—*U. S. Rubber Co.*

get ready with CONE for tomorrow

A western college is preparing courses in the management of small business, particularly for returned veterans. *Western Reserve University.*

get ready with CONE for tomorrow

Before the war we imported about one million glass eyes from Germany. Now an American manufacturer is reported to be filling a Russian order for 50,000 plastic eyes and to promise them for the use of our civilians later in the year. *American Optical Co.*

get ready with CONE for tomorrow

Three coal companies and six railroads are to collaborate in a million dollar research program to improve the coal burning locomotive. *Bituminous Coal Research, Inc.*

get ready with CONE for tomorrow

An automobile manufacturer is expected to enter the farm market with a number of new tools including a modified flame thrower for killing weeds. *Graham-Paige Corp.*

get ready with CONE for tomorrow

A new electronic piston ring inspection instrument uses beams of light to check accuracy within 0.001 inches in less than five seconds. *Sheffield Corp., Dayton.*

get ready with CONE for tomorrow

A new process claims to be able to electroplate aluminum with any of the conventional plating metals. *Alumon Euthone Co., New Haven.*

A new glass resists heat up to 1650 degrees Fahrenheit. *Vycor—Corning Glass Works.*

get ready with CONE for tomorrow

A new Diesel engine burns natural gas, coke-oven gas or sewage gas, as well as oil, without shutting down to exchange parts. *Cooper-Bessemer Corp.*

get ready with CONE for tomorrow

A new anodizing process makes magnesium resistant to corrosion. *Consolidated Vultee.*

get ready with CONE for tomorrow

The craft of gem cutting is being taught in this country to returned veterans in an effort to hold the advantage in this field that the war has given us. *Gabriel Williams, N. Y.*

A 96-pound bearing produced by powder metallurgy is claimed to be the largest of its type yet made. *Chrysler Corp., Amplex Div.*

get ready with CONE for tomorrow

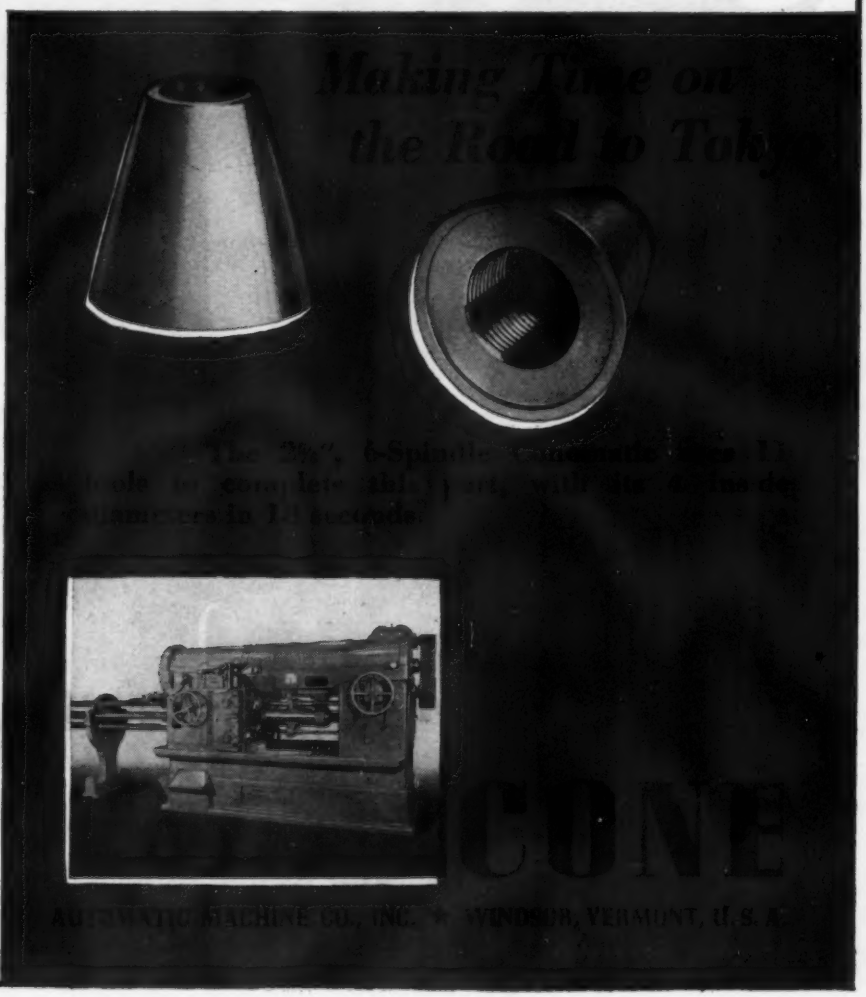
The first direct drive steam turbine locomotive to be built in the United States is undergoing tests to determine its adaptability to long-distance high-speed freight and passenger service. It is said to be capable of pulling a passenger train at 100 miles per hour. *Penn. RR Baldwin Locomotive Works—Westinghouse.*

get ready with CONE for tomorrow

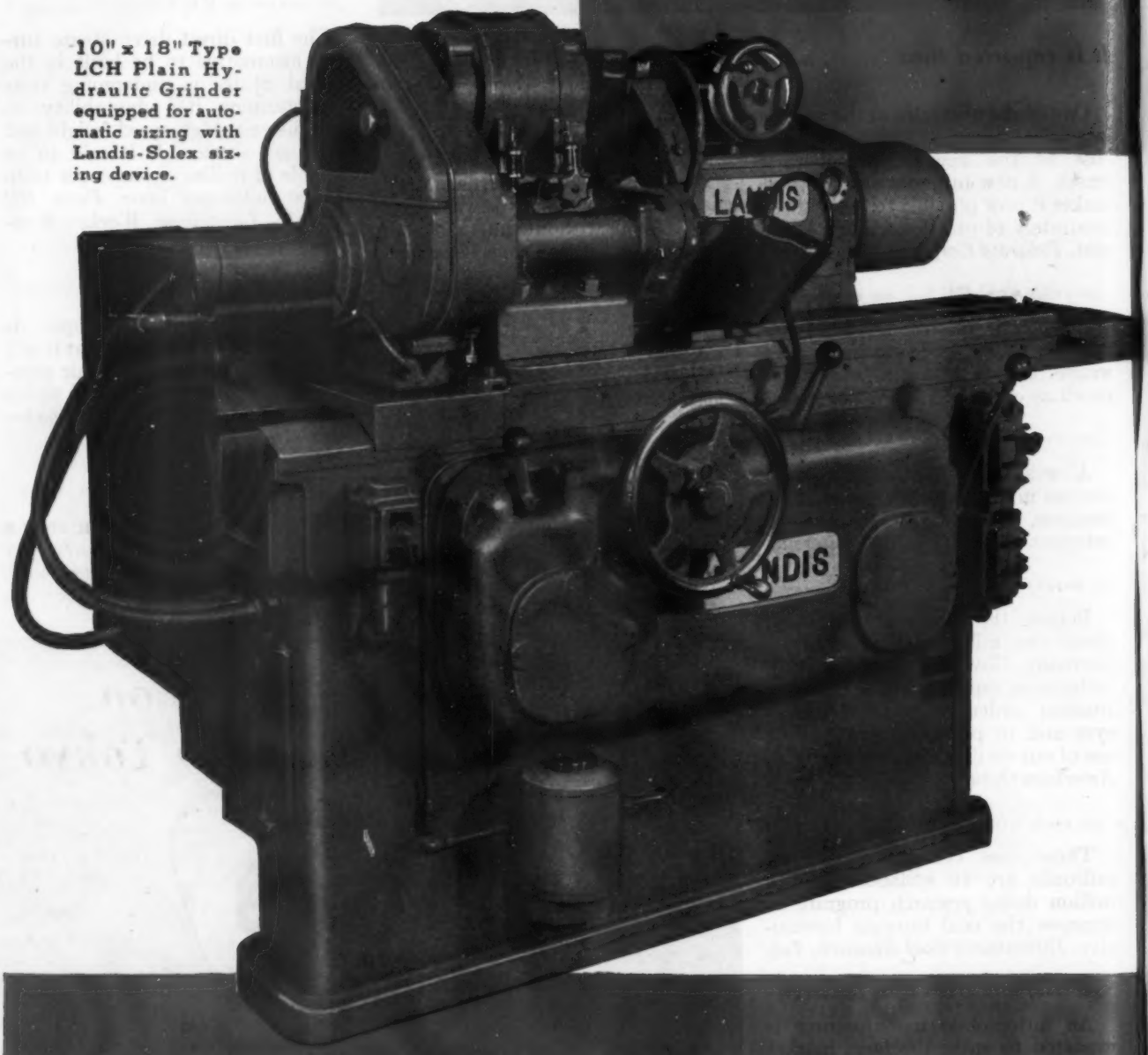
A photographic technique is claimed to be so sensitive that it will record even differences in air pressure such as shock and sound waves or air jets. *Schlieren Method—General Electric.*

get ready with CONE for tomorrow

A new dynamometer can stop a 158 ton wheel, whirling 3 miles per minute in 18 seconds. *Westinghouse.*



How

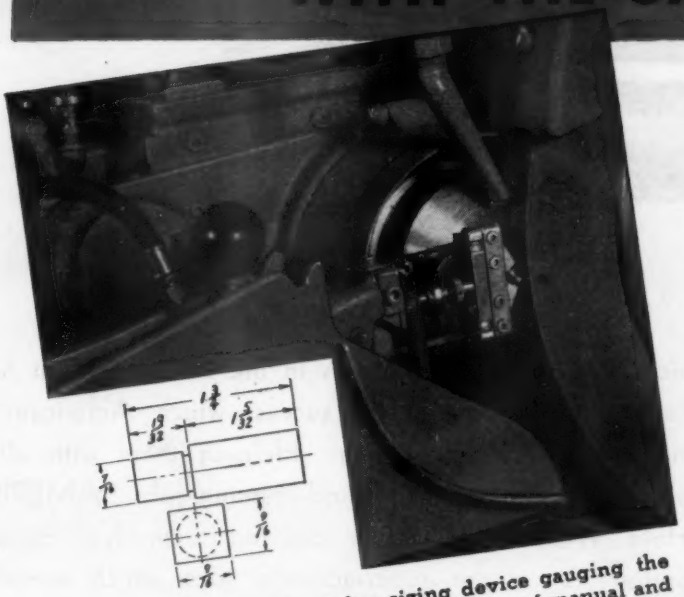


10" x 18" Type LCH Plain Hydraulic Grinder equipped for automatic sizing with Landis-Solex sizing device.

1 MAN + 2 MACHINES + AUTOMATIC SIZING } EQUALS { 2 MEN AND 2 MACHINES

Automatic Sizing

DOUBLED GRINDER PRODUCTION WITH THE SAME MANPOWER



Closeup of Landis-Solex sizing device gauging the part shown in the sketch. Comparison of manual and automatic operations shows how a man can readily handle two machines.

MANUAL

1. Chucks Work
2. Moves Sizing Device In Place
3. Starts Work Rotation And Rapid Infeed
4. Unchucks Work

AUTOMATIC OPERATION

1. Controls Feed
2. Brings To Size
3. Returns Wheelbase
4. Returns Rapid Infeed Lever
5. Stops Coolant Flow
6. Stops Work Rotation

The automatic sizing device was developed by LANDIS TOOL engineers for high production grinding jobs or long production runs. Its application to the machine illustrated is typical of how LANDIS TOOL engineers provide a specific solution to grinding problems.

An exclusive LANDIS TOOL development, the Landis-Solex sizing device controls all the necessary grinder movements. It is only necessary for the operator to load and unload. No attention is required during the grinding cycle. One operator can handle two machines and work to tolerances of .0003" on ordinary work. Since sizing is done from work diameter, accuracy is independent of wheel wear, amount of stock removed or wheel dressing.

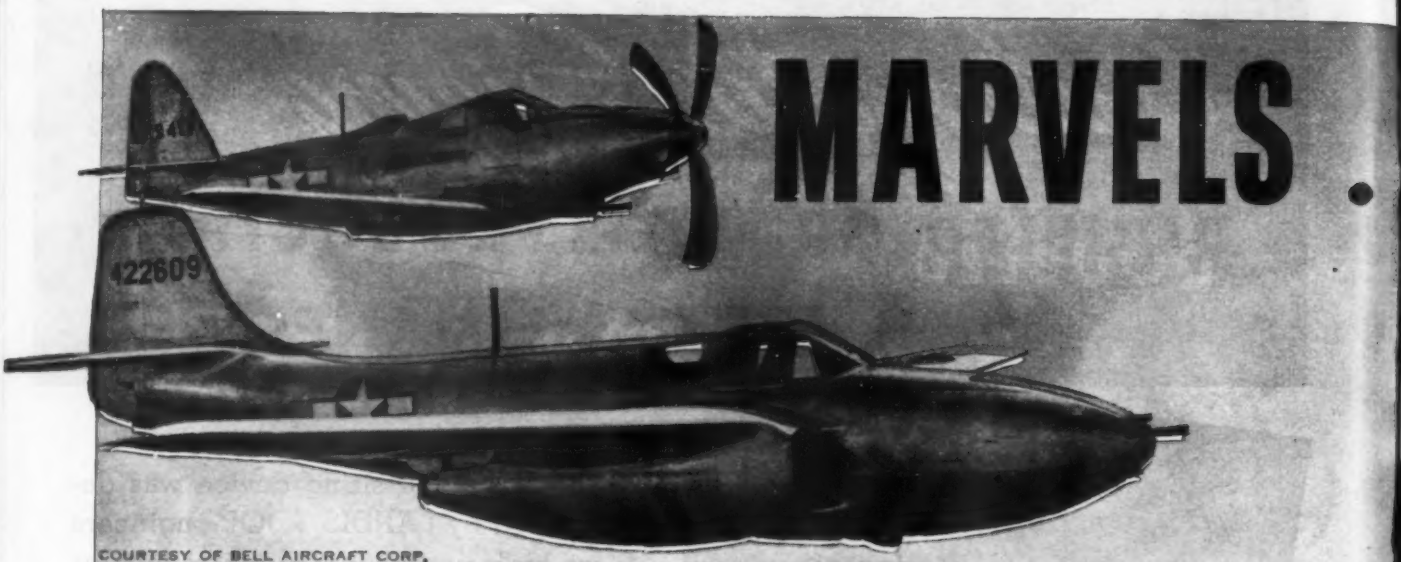
For help in solving your grinding problems call on LANDIS TOOL for a custom engineered solution.

36

LANDIS TOOL COMPANY
WAYNESBORO • PENNA.

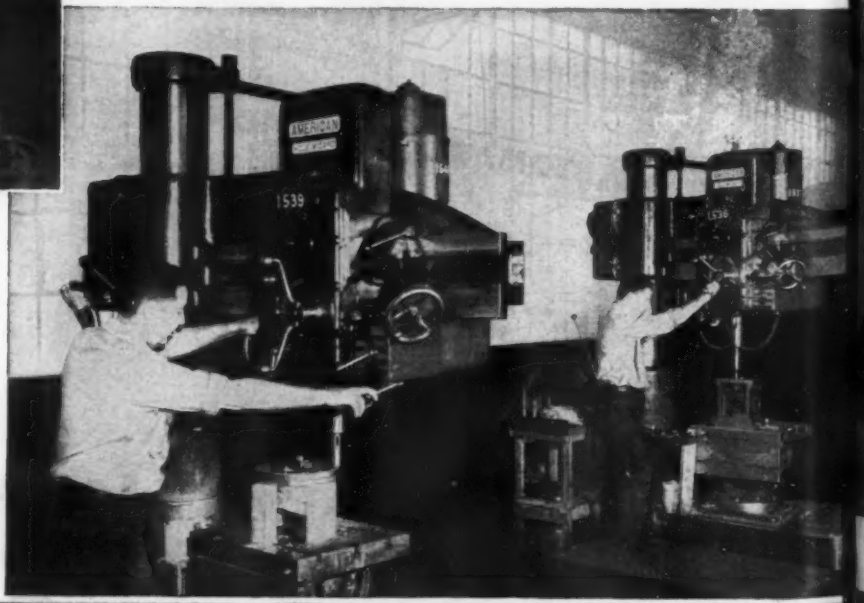
LANDIS TOOL
Precision Grinders

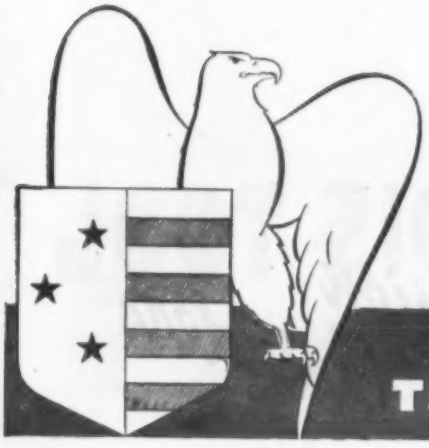
MARVELS . . .



COURTESY OF BELL AIRCRAFT CORP.

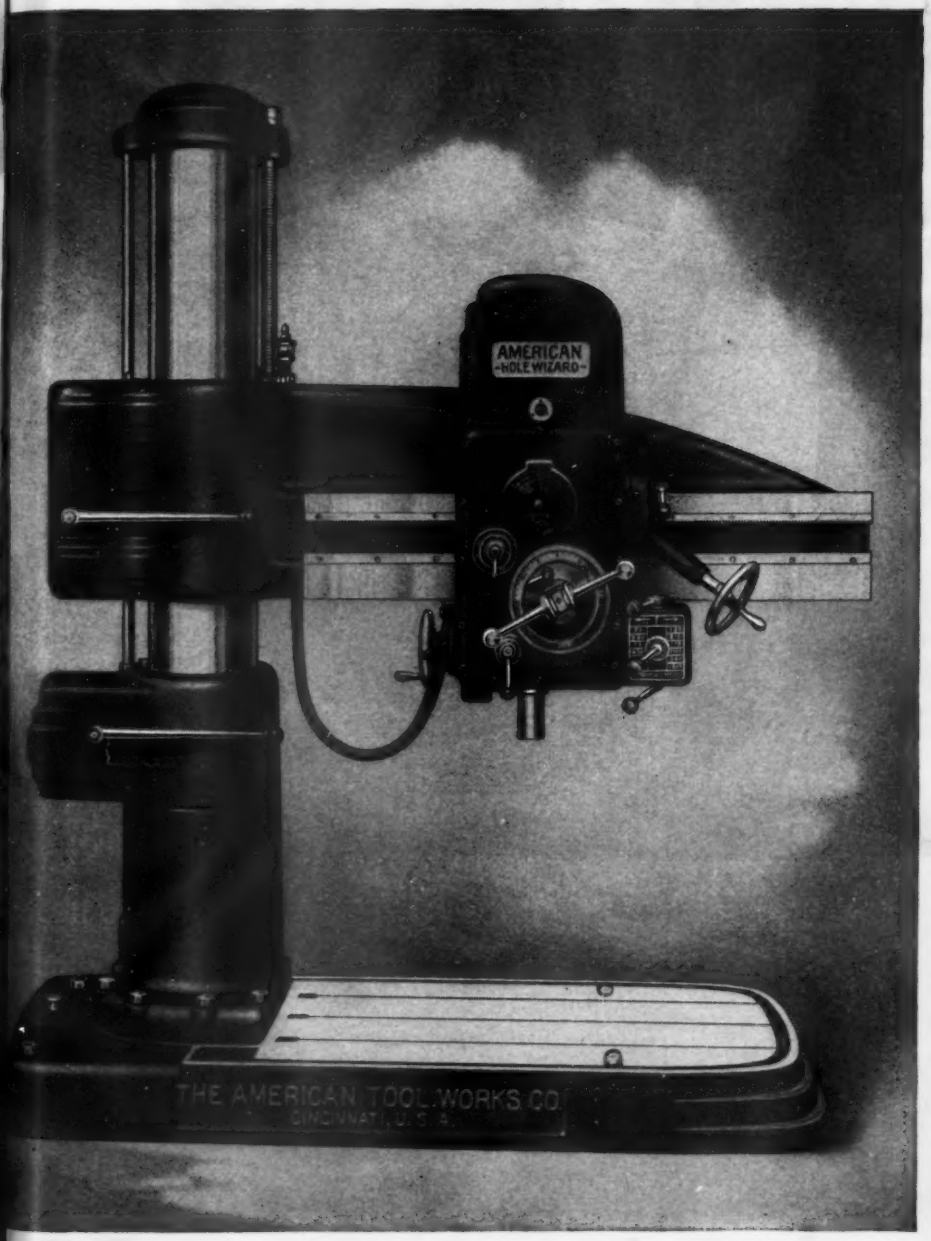
Increasing numbers of planes in the skies over our far-flung battle fronts testify to the success which American aircraft manufacturers are achieving. Helping them with all kinds of drilling, boring, facing and reaming jobs "AMERICAN" Hole Wizard Radials are proving themselves outstanding performers on the super-accurate jobs which aircraft production demands. American manufacturing skill plus "AMERICAN" Hole Wizards are a winning combination for all types of war production. Bulletin No. 310 gives all the facts. It is yours for the asking.





THE AMERICAN TOOL WORKS CO

. . of Speed and Maneuverability



It's their convenience and ease of handling that have made them the choice of both operators and cost minded production men.

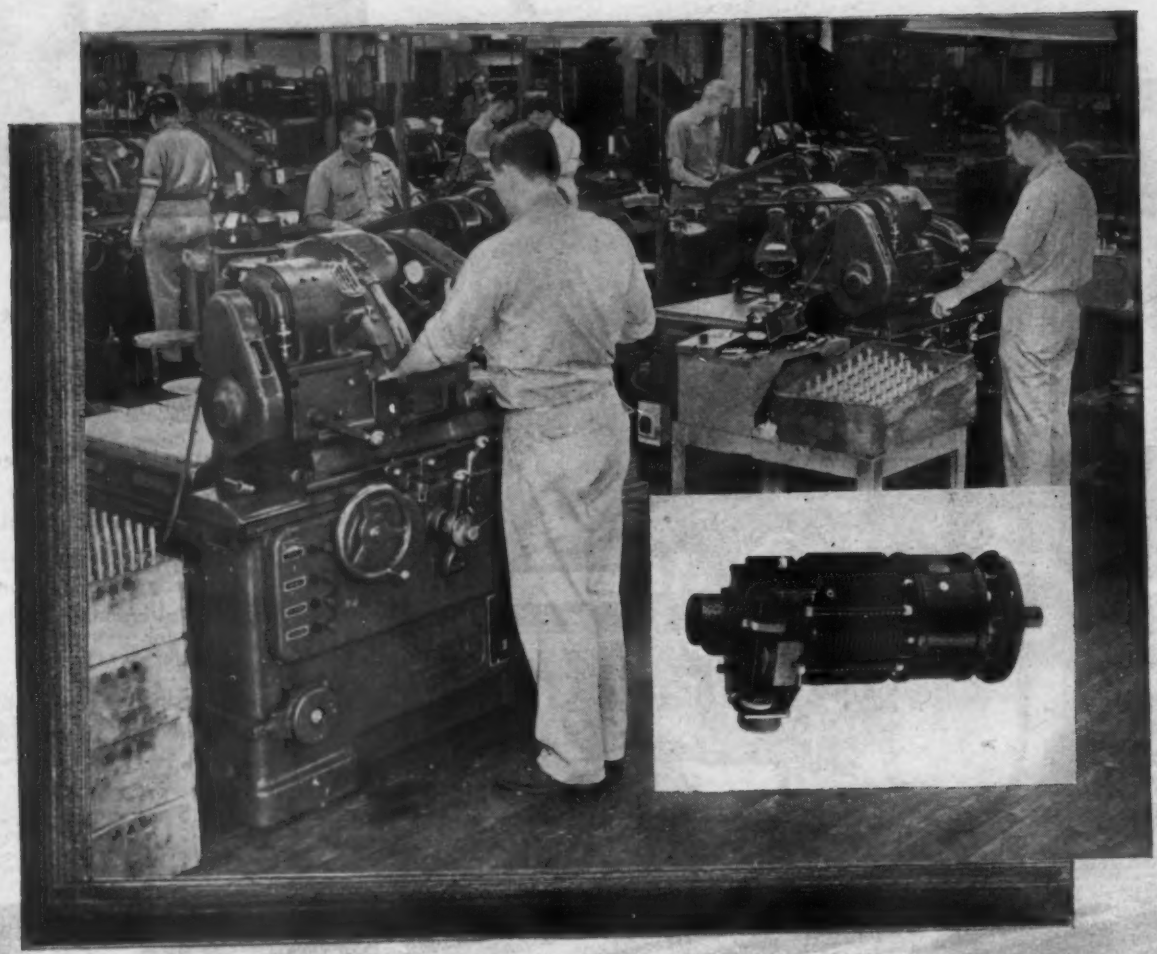
All control levers are conveniently placed and may be reached by the operator from his normal working position. The arm swings with practically no effort. The head is mounted on anti-friction rollers and feels as "light as a feather.".

To increase production and lower costs select "AMERICAN" Hole Wizard Radials.

Bulletin No. 315 upon request.

Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

PARTS VITAL TO THIS AIR AGE . . .



PARTS *Mass Produced to High Precision on* 6" NORTONS

JACK & HEINTZ, Inc., Cleveland, Ohio obtain high production with extreme accuracy on parts for aircraft engine starters, generators, motors, magnetos and flight instruments with the aid of many Norton Grinding Machines.

The battery of Norton 6" Grinders illustrated is typical of those to be found on many of the nation's production grinding lines. They are fast, accurate machines — well suited for the smaller range of center-type work.

Norton 6" Type C Grinders are available in two lengths, 18" and 30", hand or hydraulic table traverse, regular or semi-automatic models. Catalog 379 completely illustrates and describes the regular 6" Type C and Catalog 843 the Semi-automatic — copies of either or both on request.

Norton engineering knowledge is available for the exact grinding of small or large intricate parts for peacetime production.

NORTON COMPANY • WORCESTER 6, MASS.

M-509

NORTON GRINDERS *and Lappers*

COMPARE THIS
New Monarch.....
All electric drive, providing 100 to 1 range of gearless, stepless spindle speeds, forward or reverse up to 6000 rpm or higher.
Flame-hardened and ground bedways and carriage "V" —65° acute angle for accurate alignment.
Bench precision accuracy with flexibility and ease of handling from operator sitting or standing position.
Totally enclosed gear box, providing six gear changes; electric furnace hardened with ground or shaved gears.

The new Monarch 10″ Precision Manufacturing Machine. 3 hp motor gives spindle speeds up to 6,000 rpm. Swing over bed, 12½″; swing over cross slide, 7¼″; distance between centers, 20″. For full details, ask for Bulletin No. 10 M.

..... with your OLD turning machines

While only recently being generally offered to American industry, this new Monarch 10" Precision Manufacturing Machine has for almost two years demonstrated its value for fast, remarkably accurate turning of parts within its size range. Its time and cost-saving abilities have been completely proved on the most highly critical aircraft production.

Even with quickly-trained operators with no previous lathe experience, the quality, quantity and accuracy of its work have met the most strict military requirements.

It combines the bench-precision qualities of Monarch's Toolmaker's Lathes with the high-speed production of the larger size Monarch machines. Even at speeds as high as 6,000 rpm it is remarkably free from vibration, and it is fully adaptable to the use of carbide cutting tools.

Ask for details

Our Bulletin No. 10 M gives complete information and specifications, and will be mailed on request. Or, if you wish, our engineers will gladly analyze your work and help you to utilize the many advantages of the Monarch 10" Precision Manufacturing Machine. If your reconversion needs cannot be met by our present deliveries, we'll gladly try to assist you in the selection of Monarchs from government surplus stocks. Address us at Sidney, Ohio, or at our nearest branch office.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

PITTSBURGH 22, PENNSYLVANIA
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ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

Automatic Precision

. . . beyond human skill with push-button control

The Model 3-B JIGMIL

PROVIDES accuracy beyond human skill by push button control.

Automatic positioning between holes is controlled to within less than one ten-thousandth part of an inch.

Retraction and repositioning of the work for measuring or tool changing is by push button operation.

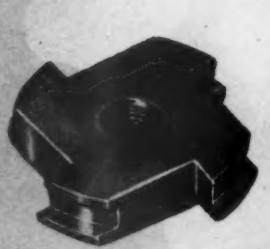
Any function is responsive to this centralized finger tip control.

The World's Finest BORING and Milling Machine

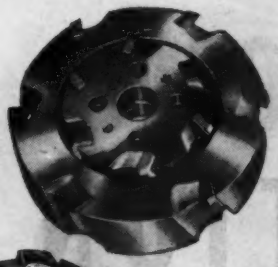
DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

CONTINENTAL *Carbide* CUTTING TOOLS

...that help you increase production at lower piece cost!



Circular form tool for form turning.



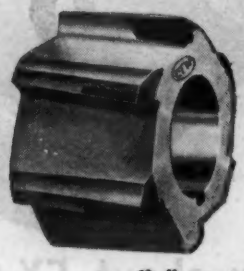
Special two-diameter cutter with inserted blades.

Cutter for forming bevel on cylinder head valve seat inserts.

Taper shank pilot reamer.

Roughing and finishing doming cutters for aircraft cylinder heads.

Tool for forming convex radius.



Shell reamer.

One quick way to new low piece cost in fast-approaching competitive days may be a retooling program that puts greater emphasis on the use of carbide cutting tools. Continental Tool Works engineers, pioneers in the application of carbide, have a unique background of experience in designing and manufacturing carbide-tipped cutting tools . . . a practical experience that is at your disposal.

Get in touch with Continental today!

CONTINENTAL TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

Continental CUTTING TOOLS

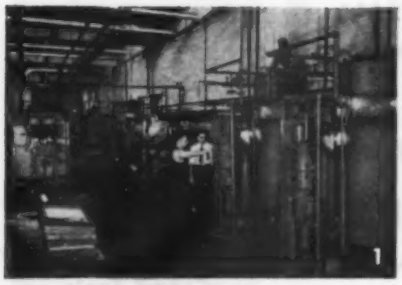
- Boring Bars and Tools
- Broaches Broach Pullers Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

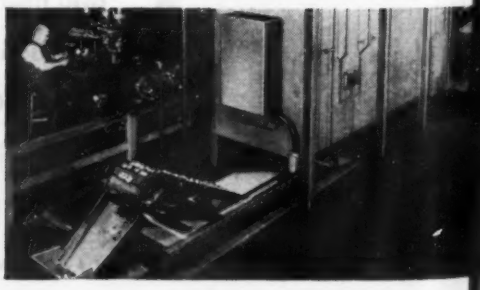
Worried about

TOMORROW'S PRODUCTION ?

Find out today about EX-CELL-O's Complete Facilities for Manufacturing Parts and Sub-Assemblies

Leadership in developing advanced manufacturing methods . . . long years of engineering experience . . . modern and complete facilities . . . that have given Ex-Cell-O an outstanding record in production for war—*all these can help you solve the problem of mass production of accurate parts and sub-assemblies for your new or redesigned products.* Ex-Cell-O, with machining, heat-treating, grinding and assembling and inspection facilities *all under one management,* offers you many practical advantages. Send your print or part or sketch to Ex-Cell-O in Detroit today, or get in touch with any member of Ex-Cell-O's field engineering staff in 32 of the leading industrial centers in the United States and Canada.





EX-CELL-O CORPORATION

XLO

EX-CELL-O Aircraft PRECISION

EX-CELL-O's *facilities:*

PRODUCTION ENGINEERING

The Ex-Cell-O organization, with skill, facilities and modern methods that have made a wartime record, can make an important contribution in the planning of quantity production of quality parts and unit assemblies for your postwar product.

HEAT TREAT

Induction Heating
Laboratory for Heat Treat Control Including Micro Examination and Photography
Atmosphere Control Continuous Hardening Furnaces
Atmosphere Control Box Hardening Furnaces
Various Types of Air-Draw Batch Type Furnaces
Gas Carburize Furnaces
Box Carburize Furnaces
Pack Anneal Furnaces
Nitriding Furnaces
Cyanide, Lead, and Neutral Salt Pot Furnaces
High Speed Steel Atmosphere Control
Vertical and Horizontal Hardening Furnaces
Continuous Air-Draw Furnaces
Sub-Zero Heat Treating Equipment

PRODUCTION MACHINES

Multiple Vertical Turret Lathes
Multiple Spindle Automatic Screw Machines
Single Spindle Automatic Screw Machines
Hand Screw Machines
Centerless Grinders
Single and Multiple Spindle Drilling Equipment
Plain O.D. Grinders
Plain I.D. Grinders
Milling Machines
Broaching Machines
Precision Thread Grinders
Precision Boring Machines
Lapping Machines
Special High Production Equipment

UNIT ASSEMBLIES

For many years Ex-Cell-O has supplied large and small manufacturers with parts and has also supplied many parts in unit assemblies after machining, heat treating and grinding.

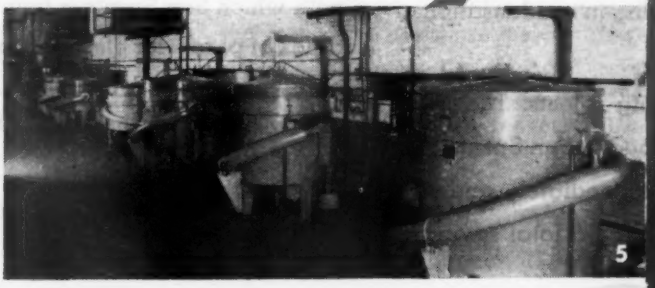
INSPECTION

Ex-Cell-O has always maintained that quality in a product is not the result of accident, that quality is built into a product by rigid adherence to accepted quality standards . . . standards that are upheld at Ex-Cell-O by efficient inspection at every step of the machining process.

To left: If you do not now receive Ex-Cell-O TOOL TIPS, devoted to precision, speed and economy in production, send your name, company, address and position to Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan.

Illustrations below: A few miscellaneous views of some Ex-Cell-O heat treat facilities, considered among the most modern and complete in American Industry.

4


5

DETROIT 6, MICH.

CLEANING-UP A $1,000 RUST-PROBLEM

SUN SPIRITS...

Cleans Small Parts, Ends Condensation Problems and Resulting Rust-Spots

A New England manufacturer was using a well-known cleaning-fluid for cleaning and drying small parts that had to pass Government inspection. Rapid evaporation caused sudden chilling, resulting in condensation of moisture.

Rust-spots were causing rejects. The management finally switched to Sun Spirits. The rusting-problem was immediately and permanently eliminated, and a total saving of $1,000 a year was the estimated result. Parts now pass inspection easily

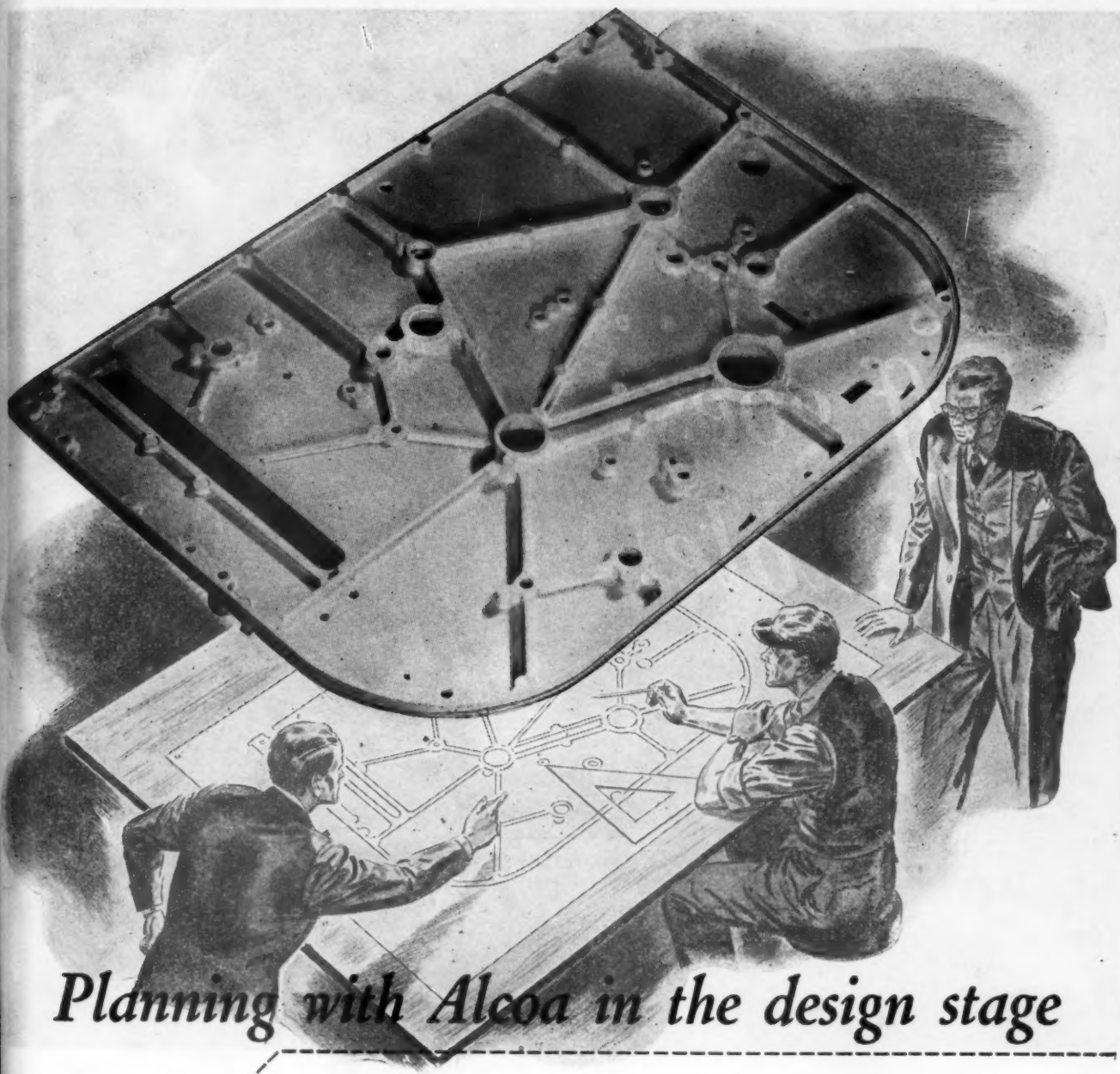
These facts from the files of Sun's industrial products division are typical of the success with which Sun Spirits is being used in hundreds of plants for cleaning metal parts and equipment. For fast, spotless, safe removal of oily films, call the Sun man near you, or write . . .

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

Sponsors of the Sunoco News-Voice of the Air—Lowell Thomas

SUNOCO **SUN INDUSTRIAL PRODUCTS**

OILS FOR AMERICAN INDUSTRY



Planning with Alcoa in the design stage

SAVES WEIGHT, TIME AND MONEY

Alcoa Die Casting Engineers like to get in on a job in the design stage. They have the facts and can often suggest ways to reduce weight, simplify the dies, save money . . . and assure maximum performance of the finished casting.

Think of aluminum as the metal best suited to give you light weight, high strength, corrosion-resistant castings, with permanence of dimensions and shape. Think of the die-casting process as one which makes possible large quantity production of parts to close tolerances, with thin sections, smooth surfaces, and minimum finishing costs. Think of Alcoa as headquarters for these aluminum die castings.

For die casting information, write to ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

Bz-z-z.. off goes Trouble!

A SOLID STRUCTURE such as a motor shaft rarely fails from the inside out—it fails from the outside in. Moral: get rid of every surface tool mark or irregularity that might someday invite cleavage.

That's what Stan Brothers, above, of Allis-Chalmers Norwood Works is doing. As he painstakingly polishes the shaft—back and forth, back and forth—he works down to a finish that's slicker than silk.

Why does he follow his job so intently? Because in 17 years at Allis-Chalmers Stan has learned that he and every other employe has a *personal* stake in every motor.

He knows that when he helps build a *great* motor for you he helps make a *friend* . . . and that friends are something no company and its workers can have too many of.

Actually, it was friends that put Allis-Chalmers importantly in the motor business in the first place.

Years ago, Allis-Chalmers began building motors only because it wanted, to put on heavy-duty equipment it built, better motors than it could buy. Then a few of those motors were sold separately to one customer, a few to others . . .

And the reputation those motors earned—"You can depend on Allis-Chalmers Motors"—literally forced Allis-Chalmers into building electric motors in volume for the market!

So the very existence of Norwood Works is proof and reminder to every Allis-Chalmers coil winder, machinist, inspector, welder, brazer, painter, assembler—that *good work catches up with a company just as surely as bad work.*

That's why you can expect *good* work in every Allis-Chalmers motor! Allis-Chalmers, Milwaukee 1, Wis.

A 1728

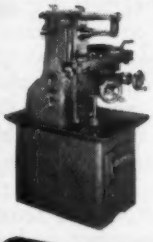
AC WE WORK FOR VICTORY WE PLAN FOR PEACE

YOU CAN DEPEND ON ALLIS-CHALMERS MOTORS

PRECISION LATHE

PRECISION TOOL ROOM LATHE

PRECISION SECOND OPERATION MACHINE



PRECISION MILLING MACHINE

MASTER COLLETS & FEED FINGERS WITH PADS

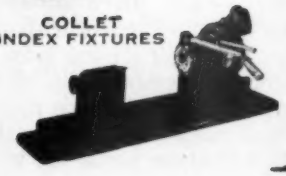
LATHE COLLETS

SCREW MACHINE COLLETS & FEED FINGERS

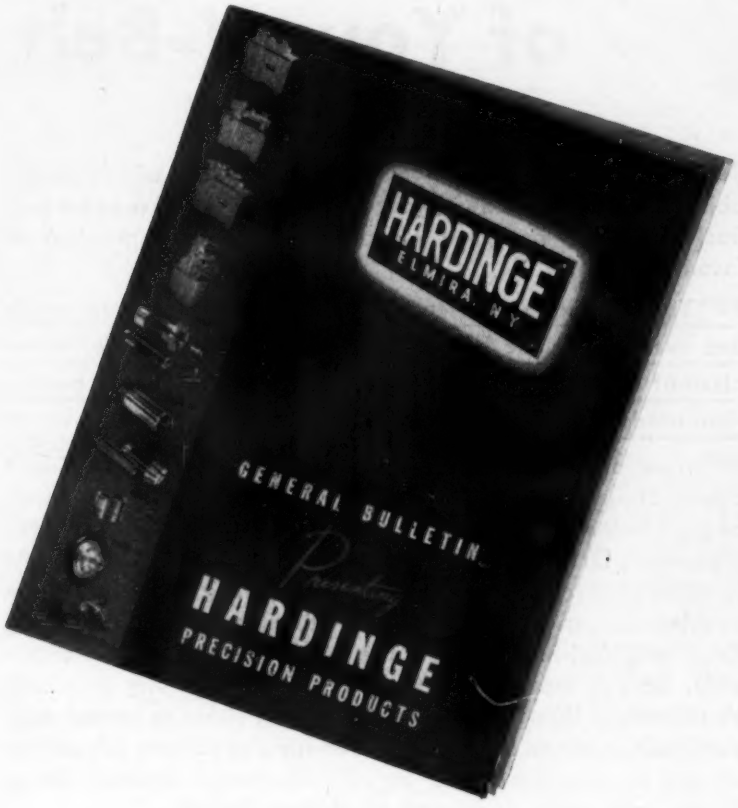
CIRCULAR FORM & CUT-OFF TOOLS

SPEED COLLET CHUCKS

COLLET INDEX FIXTURES



A request on your company letterhead will bring you a copy of



this 16 page bulletin summarizing the profit making possibilities of each Hardinge precision product.

PERFORMANCE
has established leadership for

HARDINGE
ELMIRA, N.Y.

BULLETIN!

How to Take a Reconversion Inventory of Your V-Belt Drives

☛ As manufacturing equipment becomes more widely available, and as you reconvert your production toward a peacetime basis, you may be faced with an unprecedented problem of inventory-taking.

☛ You may have to determine—more quickly than such a job has ever been done before—the EXACT CONDITION of every piece of existing equipment that you propose to use in peacetime production.

☛ Here are suggestions to speed your inventory of V-belt drives. The standards stated here will let you determine which of your *belt sets*: (1) are okay as is; (2) will shortly require replacement; (3) need immediate replacement. You should be able to place *sheaves* in the same categories, or in a fourth: (4) are obsolete . . . a common failing of sheaves, now that "Magic-Grip" and Vari-Pitch Sheaves are becoming more readily available. Or you may decide that entire *drives* belong in a fifth classification: (5) need re-engineering . . . either to correct misapplications forced by wartime shortages, or to take advantage of new developments such as Allis-Chalmers' Variable Speed Drives, with either Stationary or Motion Control.

1 START YOUR INVENTORY WITH THE RECORDS

Your records will reveal much that will be of value to you in appraising your present multiple V-belt drive equipment and in establishing its place in reconverted production.

Purchase records should show which drives have required new belts too frequently. While there's no overall rule to tell you how long a belt should last, it's safe to assume that *whenever you spot a drive* whose belts wear out *much* more rapidly than all the others, *you've found a place* where a change will save you money.

Maintenance records and *machine operating records* will reveal useful facts. Is a machine often down while belts are replaced? While sheaves are changed? Then there's room for improvement. Check trouble spots *first*. You can spot these trouble spots if you'll *start with the records*.

2 THEN CHECK DRIVE ENGINEERING

V-belt wear will be excessive — too costly for competitive peace-time operation — unless the drive is tailored to its particular power transmission job in the following respects:

Diameters—Depending on the thickness of its section, every V-belt has an "easy arc". Bend it more sharply (around a sheave of too small diameter) and the internal friction of excess flexing will cook the life out in far too short a time. In general, minimum sheave diameters for belts of given section are as follows: A—3.0"; B—5.4"; C—9.0"; D—13.0"; E—21.6".

Centers—The shorter the centers in a drive, the fewer feet of belt that can stretch—the lower the potential stretch to threaten slippage and crack-the-whip action. Thus proper engineering aims at short centers. (Short centers have the further advantage of saving valuable floor space . . . an important consideration in many factories.) In every re-application of V-belt drives for reconverted production, remember . . . *keep centers as short as possible.*

Number and size of belts — Each V-belt is rated for horsepower; simple mathematics will tell you how many of what size you'll need for a given job. When reconverting, it's wise to *check this again* . . . the war has produced many undesirable makeshifts. Remember, though, that number and size don't tell the whole story—*speed counts too.*

Belt speed—Just as a truck's motor can pull a heavier load by traveling faster, so a set of V-belts can pull a heavier load by traveling faster. In a truck, it's a case of using a "lower" gear. In a V-belt drive, it's the same . . . using larger sheaves which have a higher rate of rim travel, thus producing higher belt speed. See the V-belt manufacturer's catalog for limits of speed recommended for any given belt.

Contact arcs—All horsepower ratings for V-belts are based on a 180 degree arc of contact with sheaves. However, this factor varies from one drive to the next—depending on its ratio and centers—and must be carefully considered in re-engineering any drive.

Tension—Each drive should be equipped with an effective tension adjustment. Belts that are too loose will slip, rub on the groove walls, heat up, and have the life cooked out of them. And when the wave curve in a loose belt whips it *tauter* across the tension

side of the drive—that belt grabs at the load, may snap. So—in checking V-belt drives for reconverted production, it's important to see to it that each set of belts has proper tension. The easiest and quickest rule-of-thumb test for proper tension is this: "A slack V-belt feels dead when you thump it with your hand; a properly taut V-belt has an alive springiness."

Alignment—Unless the shafts of the driving and driven sheaves are *parallel*, it's impossible to put *all* belts in the set at proper tension . . . and all belts run at an angle, rubbing on the groove walls, heating themselves for an early death. In reconverting for a competitive production, check parallelism of shafts . . . and check too to see that *sheave grooves* are *in line*. Out-of-line sheaves also subject belts to needless rubbing on the groove walls.

If any of your V-belt drives is notably weak in any of the above seven points, consider re-enginering the drive.

3 THEN INSPECT V-BELTS

Your inventory of working V-belts will reveal far more than just their condition; it will also show what should be done to correct existing conditions that promote V-belt wear—an important consideration in cost-conscious, competitive production. Check every belt in every set for the following tell-tale signs; note condition of belt, cause, and recommend cure.

Checking these points is especially important if you're planning a *continuous* operation where belt breakage would be fatal. You can spot about-to-break belts by looking for:

SCUFFING—*Cause*: Bolts protruding inside the guard may do this. Such scuffing can exert enough "braking" to cause sudden snap and break belt.

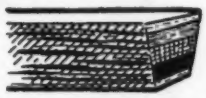
Cure: When placing guards or steelwork near drives, anticipate some sag . . . leave enough clearance.

SLIP BURN—*Cause*: Belt too loose to pull its load. Belt stands still, rubbing on spinning driving sheave, heating and melting the rubber.

Cure: Keep belt taut, and sheave grooves free of oil and grease. Check machine for overload.

OIL-SWELLING *Cause*: Belt is is swelled and weakened by chemical action of oil.

Cure: Provide splash guards, or use Oil-Resisting or Oil-Proof Texrope Belts.



ABRASION—*Cause*: Abrasive dust wears the sidewalls, narrowing belt width. Then belt slips, rides on bottom of groove.

Cure: Provide dust guards, keep proper tension.

4 CHECK BELT ENGINEERING

Because Allis-Chalmers belt development during wartime followed the familiar pattern of many industrial achievements—moving swiftly and outmoding many previously-acceptable types—it is *not* wise policy to replace belts by blindly ordering the same kind used in the old installation. Belts have become specialized for better economy, safety and dependability. It is time now to take a look at qualities of the new belts, and to take advantage of the special properties they have been given through use of new synthetics in their manufacture.

NOTE: THE MATCHED-SET PRINCIPLE—When one or two V-belts in a set are worn out or damaged, remember that the remaining V-belts have stretched beyond their original length, making it impossible to put proper tension on an old set to which *new* belts have been added. Adding new belts is therefore likely to be false economy . . . the new belts will overwork, lasting for only a fraction of their normal life. Rather than throw good money after bad, always install a complete, scientifically-matched set, storing old belts to use as replacements in other old sets.

5 INSPECT SHEAVE WALLS

For smoothness—What makes a V-belt grip the sheave? Not mere surface friction, but the *wedging* action of the bending and expanding belt. So sheave grooves may be smooth . . . *should* be smooth, to minimize belt wear. Watch out for ridges or burrs in the groove walls; if they're bad, re-groove or replace the sheave. Increased belt life will soon pay the cost.

For straightness—The sides of the V should be *straight;* if they're not, drive won't be truly efficient, belt life will be short. Some sheaves—misaligned or in hard usage—get "shoulder wear" in groove walls. Lay a straight-edge against the wall, look for a light gap. If you find hollows deeper than the thickness of a playing card, sheave needs truing.

REPLACE? OR REGROOVE? You'll have to make this decision. Note this: where small, inexpensive stock size sheaves show need for re-truing of grooves, time and trouble can often be saved by scrapping them and replacing with new sheaves. It may pay out, however, to re-groove special or large-diameter sheaves, or to return them to the factory, where a nominal charge is made for this service.

RECONVERSION INVENTORY CHECK LIST FOR V-BELT DRIVES

1. Present Condition of Drive
2. Present Condition of Belts
3. Present Condition of Sheaves
4. Drive Engineering
5. Belt Engineering

Ask A-C for sample copies of this V-Belt Drive Inventory Check List.

CENTRIFUGAL PUMPS, ELECTRIC MOTORS NEED INVENTORY TOO!

All three of these common industrial units — V-belt drives, centrifugal pumps, and electric motors — are covered in Allis-Chalmers' new *Reconversion Inventory Kit.* No big package, this Kit is simply a set of Fact Sheets and Check Lists, with suggestions for Inventory procedure as outlined on these pages but in slightly more detail.

A 1884

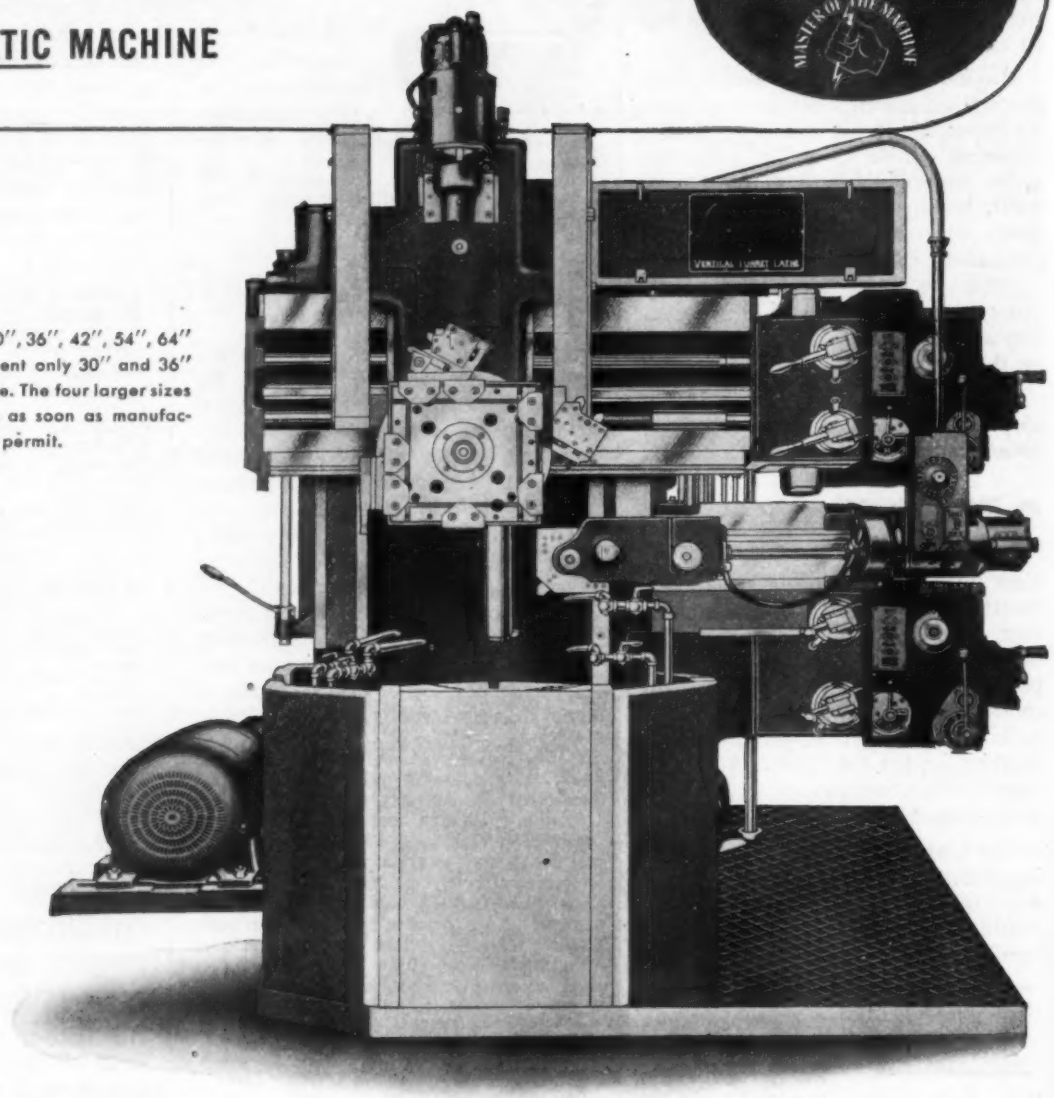
GET THESE FREE FORMS!

For your supply of Reconversion Inventory Kits, covering V-belt drives, centrifugal pumps, and motors, call your nearest Allis-Chalmers district office or distributor, or write Department 119, ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WIS.

ALLIS A-C CHALMERS

ONLY A BULLARD MAN-AU-TROL V.T.L. ALLOWS MANUAL OPERATION OF AN AUTOMATIC MACHINE

BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE



Machine sizes: 30", 36", 42", 54", 64" and 74". At present only 30" and 36" sizes are available. The four larger sizes will be available as soon as manufacturing conditions permit.

. . . *because* MAN-AU-TROL *is*

the automatic control that is as versatile as manual control

When you decide to buy a Bullard MAN-AU-TROL V.T.L., your chief reason will be that you want all the benefits of an automatic lathe *plus* all the versatility of a manually-operated machine.

To these benefits, add another. Suppose you have your MAN-AU-TROL V.T.L. all set up for automatic production of a piece with Bullard standard-type tooling. Along comes a rush job for one piece of an entirely different kind. The chances are that you will find it profitable to change the tool set up for manual operation on this one piece . . . without, of course, disturbing the automatic cycle. When that one-piece job is finished, you quickly reset your tooling by means of gauges, and before you know it, the machine is back on the production run with the automatic cycle.

Other benefits you will get from the Bullard MAN-AU-TROL V.T.L. are fully described in Bulletin MAV-G-1. Write today. The Bullard Company, Bridgeport 2, Conn.

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

Again the stability and long life of Gulf Super-Quench have been conclusively demonstrated!

Here's the service record of Gulf Super-Quench in a prominent ordnance plant:

Period of Service	2 years
Parts quenched	Small bore rifle barrels
Type of steel	WD 1350
Tons quenched	over 1650
Oil consumption gal/ton	1.48

Remarks: *Super-Quench readily produced the required physical properties, superior machining qualities!*

No significant change in orginal characteristics after this extensive service!

SERVICE RECORDS like this prove that Gulf Super-Quench not only produces more uniform hardness in many types of steel, but also that this revolutionary new quenching oil has remarkable stability and endurance! Note the consumption of Gulf Super-Quench, which is exceptionally low in view of the relatively large surface area to the mass of steel quenched.

Note, too, that there has been no significant change in the original characteristics of Gulf Super-Quench after this extensive service. This was determined not only by assay physical properties of the oil, but also by carefully controlled quench tests.

Call in a Gulf Service Engineer today and let him show you how Gulf Super-Quench can help you improve your quenching practice. For your copy of the latest pamphlet on Gulf Super-Quench, send the coupon below.

Gulf Oil Corporation · Gulf Refining Company
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Please send me, without obligation, a copy of the brochure, "Gulf Super-Quench."

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Title.....

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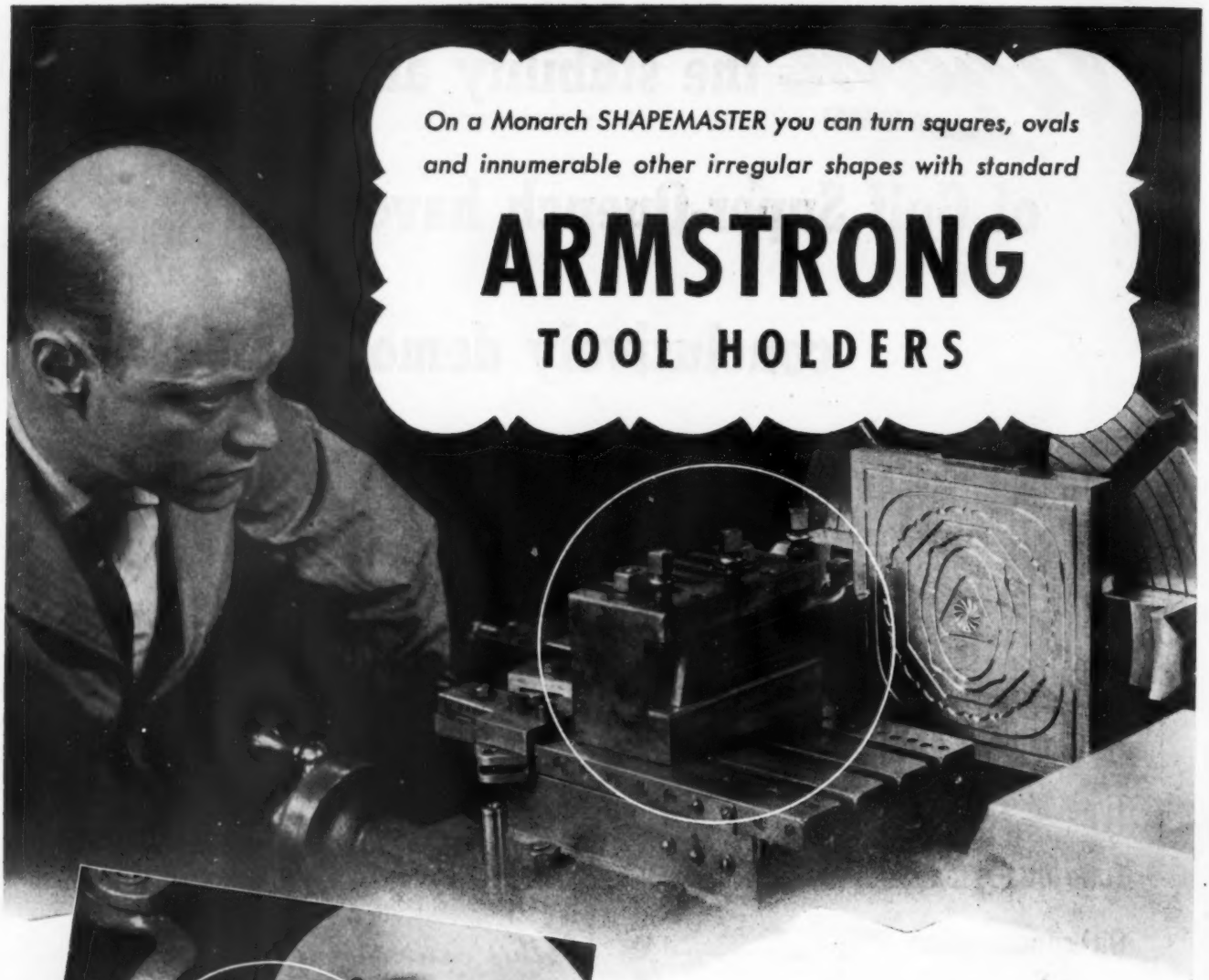
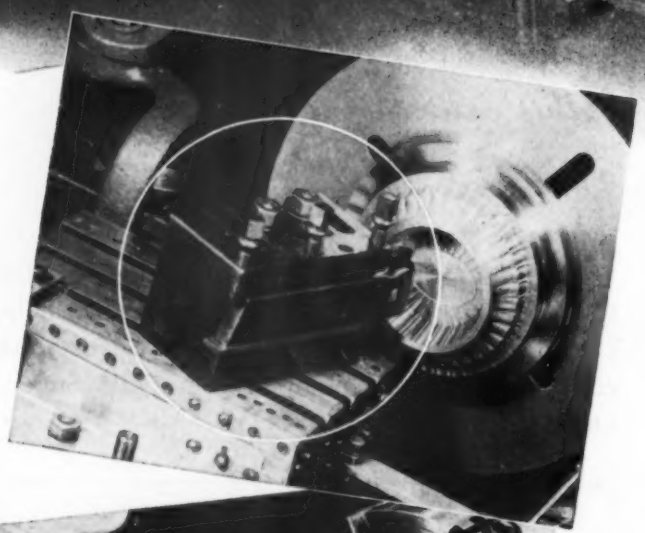
GULF INDUSTRIAL LUBRICATION

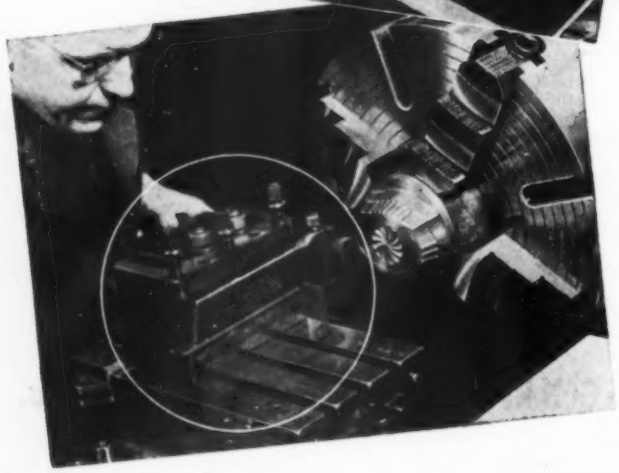
Gulf Oil Corporation · Gulf Refining Company, Pittsburgh 30, Pa.

On a Monarch SHAPEMASTER you can turn squares, ovals and innumerable other irregular shapes with standard

ARMSTRONG
TOOL HOLDERS







The phenomenal Monarch SHAPEMASTER performs the most astonishing operations. Basically a 20" Monarch Lathe, when fitted with the SHAPEMASTER Mechanism, it will turn squares, ovals, hexagons, octagons and multiple sided shapes in irregular contour pieces. Almost any desired shape can be transmitted by the cutting point to either outside or inside diameter or face of the work.

The result of many years of engineering and development, the SHAPEMASTER is distinctly *modern* and advanced in its design in every detail. Still, for most of its unusual operations it is tooled with ARMSTRONG TOOL HOLDERS, of the standard types universally used on ordinary lathes in 96% of the machine shops and tool rooms.

These ARMSTRONG TOOL HOLDERS are selected not only because they "Save: All Forging, 70% Grinding and 90% High Speed Steel" but also because they have the strength to support the cutting edge rigidly not only against a normal down feed but against end thrust, side and torsional strain as well.

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"The Tool Holder People"
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Invitation

If special *small gears* form a part of your post-war problems, we invite you to let G.S. assume this responsibility. For here at "Small Gear Headquarters" are methods and machinery so precise . . craftsmen so capable, that long since we've become recognized as the largest exclusive manufacturers of Fractional Horsepower Gears in the world! Surely the specialized skill and friendly cooperation of G.S. Small Gear experts will prove a decided asset to your post-war business.

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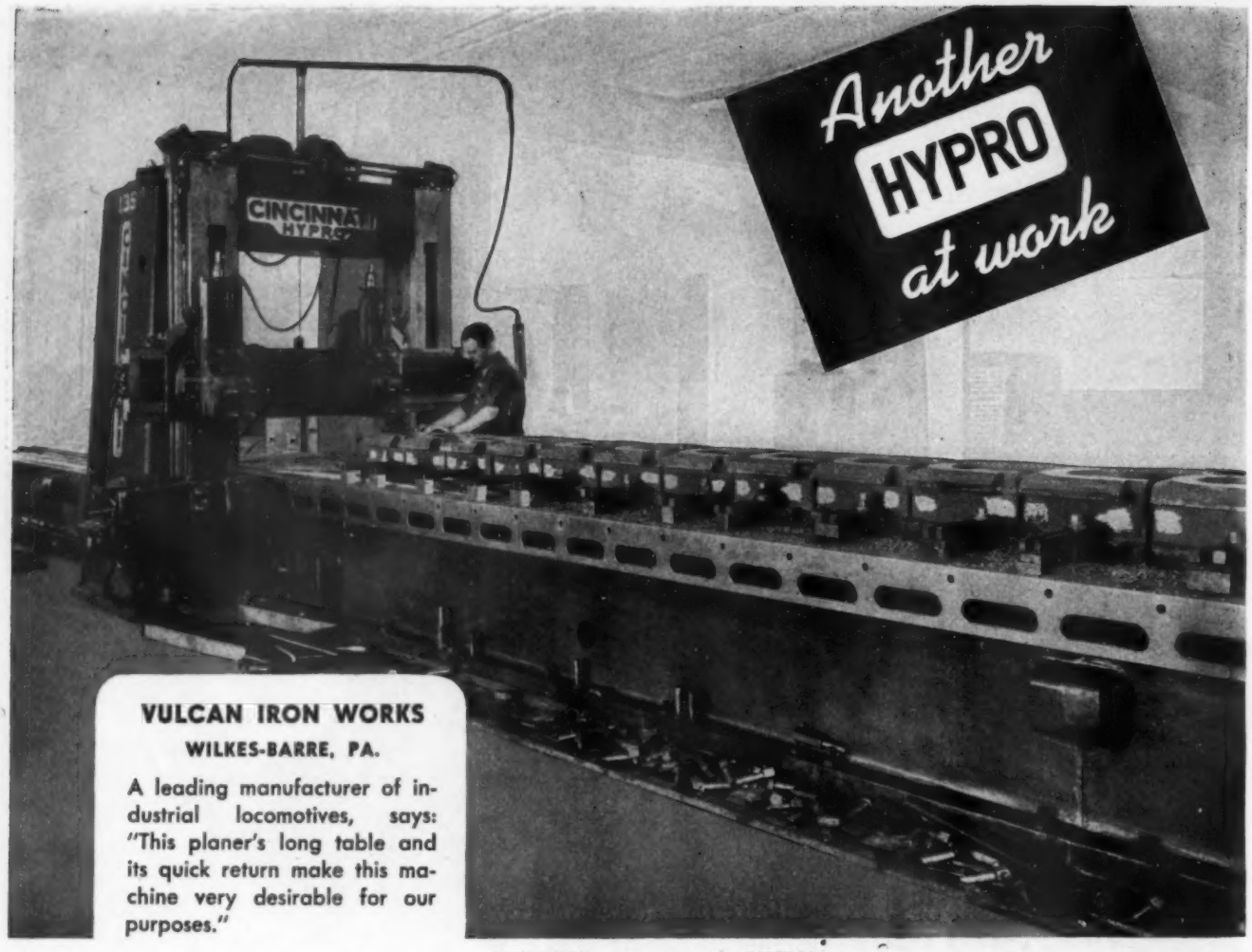
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS



VULCAN IRON WORKS
WILKES-BARRE, PA.

A leading manufacturer of industrial locomotives, says: "This planer's long table and its quick return make this machine very desirable for our purposes."

FACING off locomotive driving boxes with precision—at a very profitable speed.

Its long table and quick return increase production by cutting labor hours, yet its simplicity of operation, finger-tip control and safety at high speed make it desirable to the operator. With a minimum of physical and mental strain, he produces a maximum volume of approved parts.

Used just as effectively on driving and connecting rods, as well as other jobs, it is designed to become a leader in profit making in the planer field now and for the post-war period.

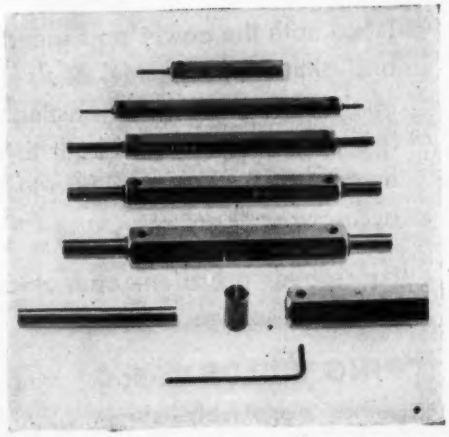
THE CINCINNATI HYPRO PLANER COMPANY
PLANERS · BORING MILLS · PLANER TYPE MILLERS
CINCINNATI, OHIO

Van Keuren

PRECISION CHROMIUM PLATING applied to Plug Gages

THE Van Keuren Co. has developed a new method of precision chromium plating of wire type and taper insert plug gages. In this modern plant we have combined the best available plating practice with the ability to make precision measurements. We are able to deposit a chromium wear surface accurate to a few millionths of an inch. Gages are finished to the low wear limit and then are plated to the high wear limit. The result is a thin, closely adhering wear surface which will not crack or peel and which is available at a very moderate cost.

Instead of paying 50 to 75% additional for chromium-plated gages, they are now available for only 25% additional and they wear 3 to 5 times as long as steel gages. The many repeat orders which we are getting from large users indicate that this new method is resulting in more prompt deliveries, greater wear, lower gage cost, and satisfied customers. For your next gaging job, specify Van Keuren chrome-plated gages.

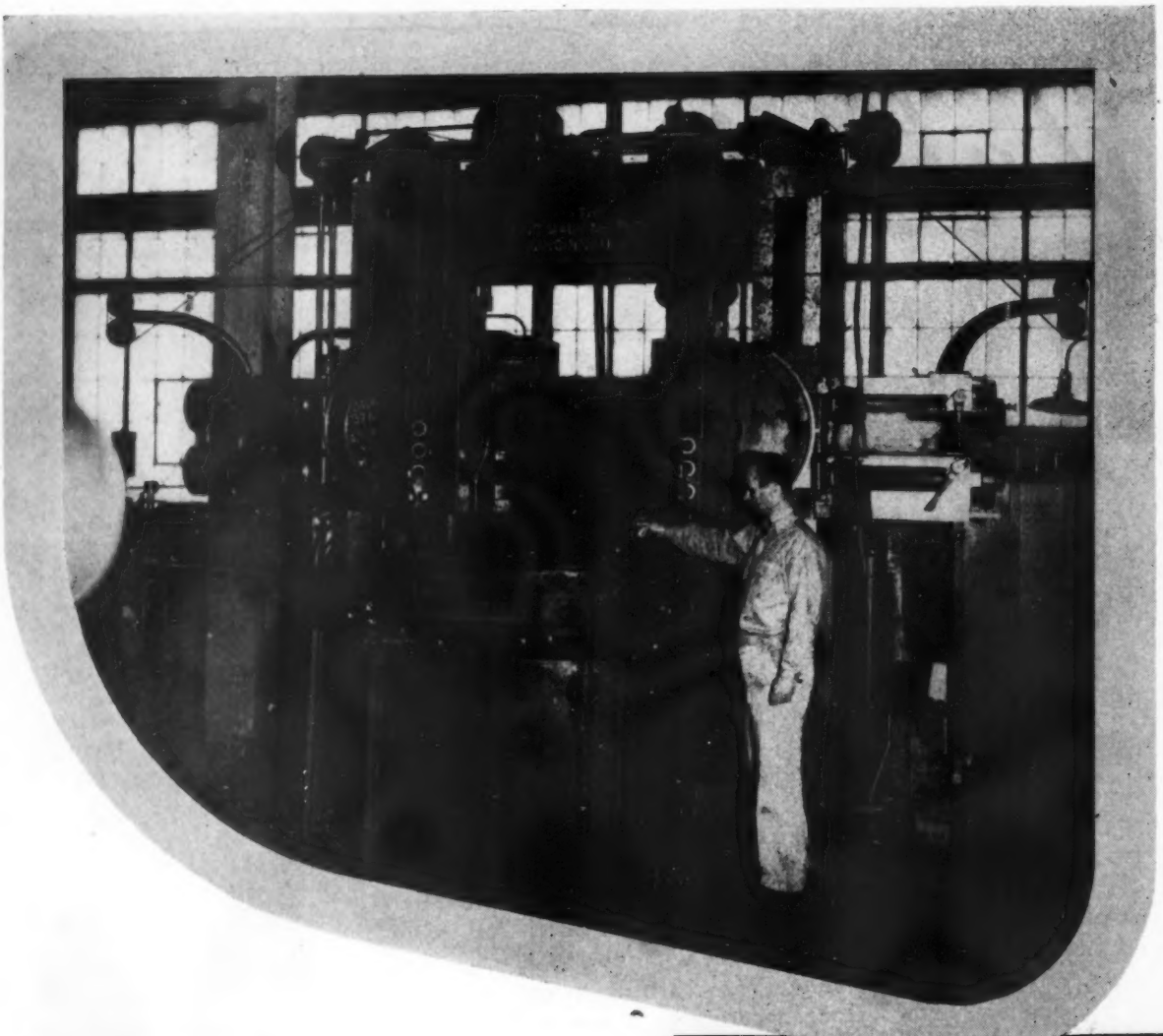


Handbook and Catalog No. 33.

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

25th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles.



● For example facing a steel casting like the one shown the KING Vertical Boring and Turning Machine has the necessary rigidity to turn out a smooth, precision job.

It has both the power and speed to handle carbide and similar alloy steel tools for turning steel—semi-steel or gray iron castings with equal ease. It is also designed and built to stand the grind of heavy, 24 hour a day, production and maintain accuracy.

For speed—precision—and ultimate economy put your next job on a King.

KING BUILDS Vertical Boring and Turning Machines exclusively—single column types from 30" to 42"—double column types from 52" to 12 feet.

When the job calls for precision
Turning - Boring or Facing
put it on a
KING
VERTICAL BORING & TURNING MACHINE

THE KING MACHINE TOOL COMPANY
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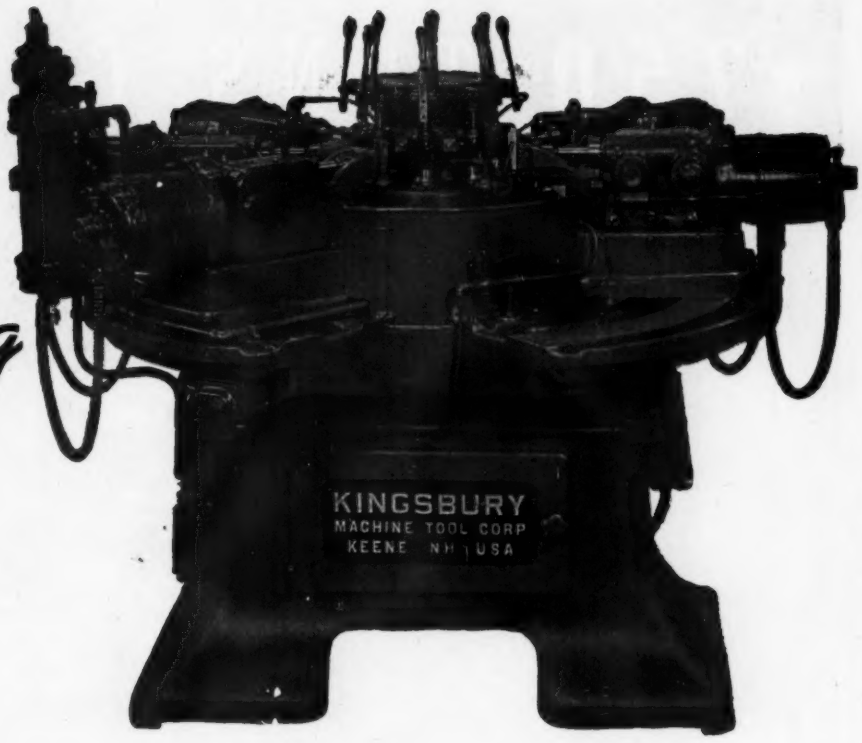
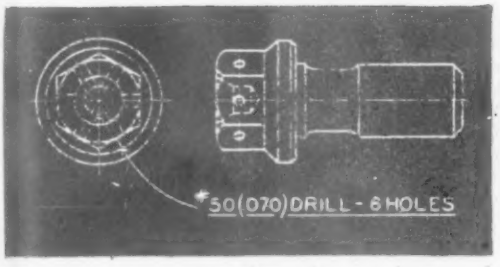
BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

Loading and Unloading While Drilling assures Continuous High Production



FLEXIMATIC



by KINGSBURY

This six-spindle FLEXIMATIC is set up for drilling lacing holes in the heads of screws for airplane motors. High production, so essential to parts involved in the speeded up program of this important phase of National Defense, is being achieved with minimum effort on the part of the operator.

The main turret of this FLEXIMATIC contains eight individual turrets which index 60° at each index of the main turret. Each of the six automatic drilling units on the machine drill a hole from the outside face of the hex head into the center only. The operator merely loads and unloads at the loading station while the holes are being drilled at the other stations on the machine. All six drilling operations are performed in a single chucking of the work.

Speed, convenient handling, accuracy and continuous production are universally recognized advantages offered by FLEXIMATICS regardless of the nature of the job assigned them to handle. The specific work being performed here is typical of many others where FLEXIMATICS are the machines for jobs calling for the maximum in time savings.

THIS IS A FLEXIMATIC AIRPLANE JOB!

Kingsbury Standard Units for drilling, reaming, boring, spotfacing and milling can be mounted in any combination, operated automatically and changed over quickly and easily to suit the requirements of the work to be handled.

KINGSBURY MACHINE TOOL CORPORATION

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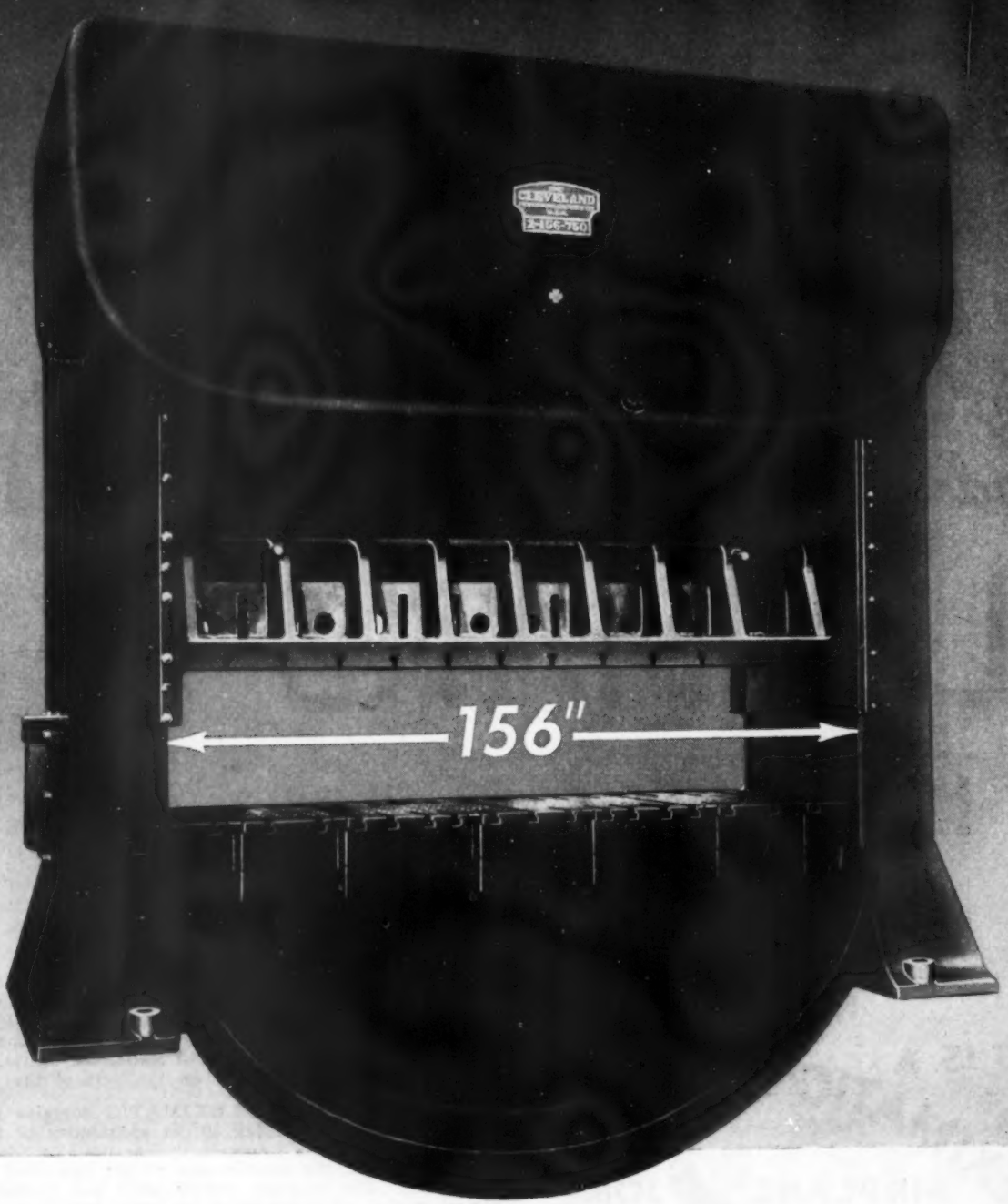
★750 TONS CAPACITY



This Modern Cleveland Two-Point Press, which measures 156" between the uprights, exerts a pressure of 750 tons. The Press is equipped with an electrically controlled, air operated friction clutch and brake and the flywheel is provided with an air brake which is used to bring the flywheel to a quick stop when the power is shut off.

The gears, flywheel, clutch and drive unit are all enclosed in the box type crown and are arranged for easy removal, if necessary.

Cleveland Single Point—Two Point and Four Point Presses can be furnished in sizes and capacities to suit particular requirements.

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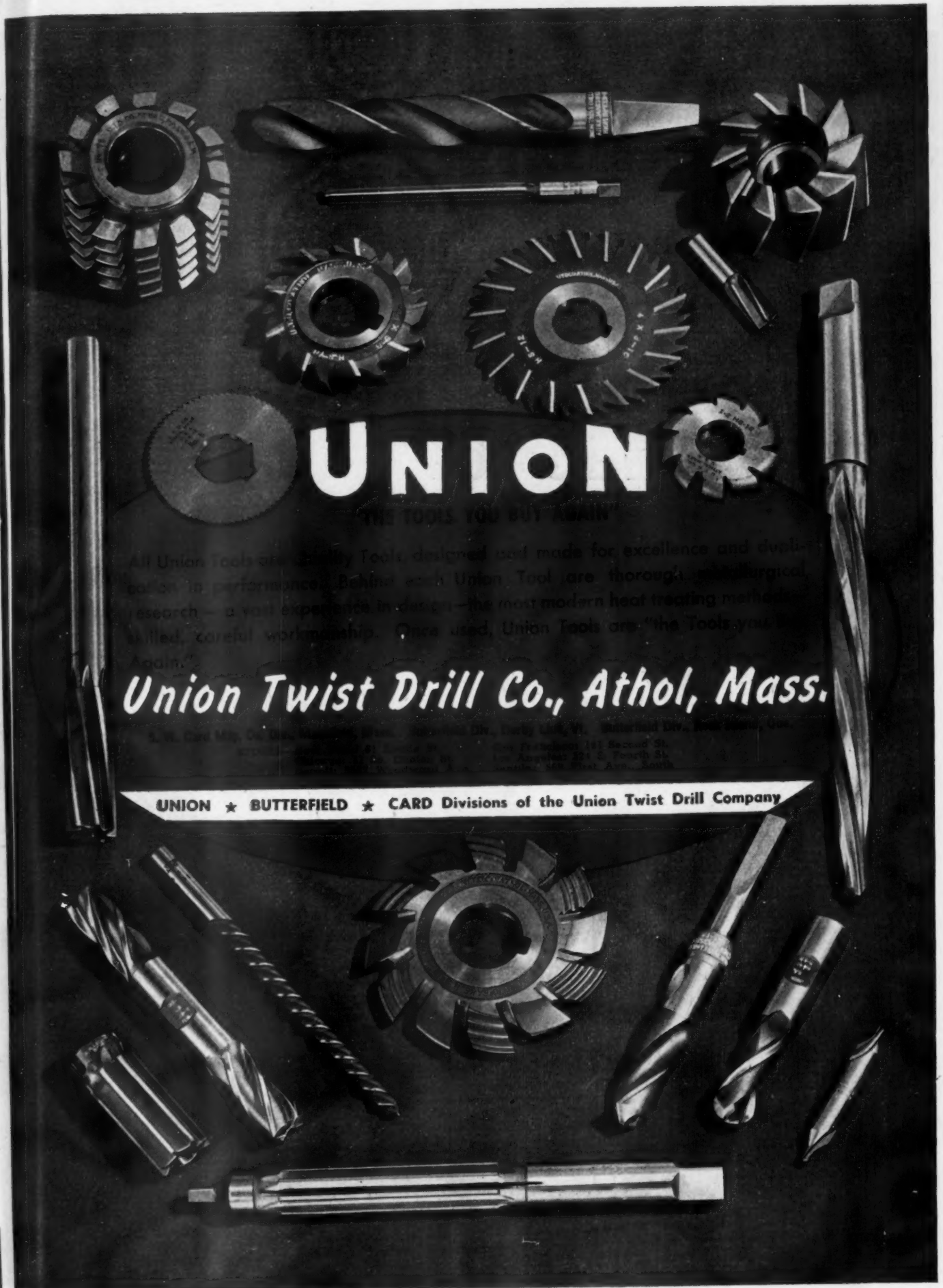
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Increased production facilities enable Card to make prompt Deliveries in all sizes and types. Exceptionally high quality uniformly maintained, and unquestioned accuracy make these Tools profitable equipment in the shops where sustained production is the difference between profit and loss.

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Results of ten years of full-time study and development are graphically illustrated in this first pictorial booklet on crush form grinding precision contours with surface grinders. Savings in time and labor and improvement of finished work made possible by completely engineered machines warrant a thorough investigation of this machine process.

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The New KENNAMILL "UNIVERSAL" FACE MILL

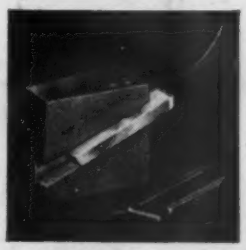
WITH WEDGED-IN, SOLID KENNAMETAL BLADES

Reduces

- ✓ PRODUCTION COSTS
- ✓ TOOLING COSTS
- ✓ OFF-THE-JOB TIME
- ✓ GRINDING EXPENSE

ADAPTABLE FOR HIGH RATE MILLING ON ALL TYPES OF METAL

"Universal" Cutters for milling different materials vary only in the grade of Kennametal used in the blades, and the cutting angles. Kennametal blades are wedged into the body at fixed angles of 14° positive radial and 7° negative axial. Before being inserted, they are ground to provide a radial rake suitable for the material to be milled—7° negative for steel; 5° positive for cast-iron, brass, and bronze; 14° positive for aluminum and magnesium alloys. Only the blades are ground—the steel body is a permanent tool holder.



BLADES ARE RESHARPENED ON SURFACE GRINDER

Kennametal blades are reground uniformly to proper angles on a surface grinder, while being held in a simple jig. Illustration shows Kennametal blade in jig having top land ground, which, in conjunction with fixed blade angle in body, provides proper radial rake. Jig rests on another face for grinding clearance angle, and on a third face to grind face cutting edge angle. For finish cuts the face of the cutter is touched up on a cutter grinder. Reconditioning consumes much less time than is required for conventional cutters. Additional time is saved by having resharpened spares ready for quick replacement.

The Kennamill "Universal" Face Mill can be used for milling different materials, at high rates of metal removal, simply by interchanging blades having the right grade of Kennametal and proper cutting angles. Advanceable, solid Kennametal blades are wedged into the sturdy steel body at fixed angles, after having been ground on the edge to provide an effective cutting angle—negative radial rake for steel; positive radial rake for cast-iron and non-ferrous materials.

All design features of this cutter contribute to the possibility of removing a large volume of metal between regrinds. Radially set blades, rigidly supported, maintain their edge longer; and, because the blades are wedged-in instead of brazed-on, brazing strains are eliminated, either initially or during grinding. Hogging cuts, up to a depth of ⅛", are entirely feasible. Ample chip accommodation is provided for all depths of cuts.

The solid Kennametal blades can be reground on a surface grinder, as described at the left, thus eliminating need for special cutter grinders, and greatly reducing off-the-job-time required for reconditioning cutters having brazed-in tips. Blades can be resharpened many times, then used in smaller "Universal" Cutters.

The Kennamill "Universal" Face Mill is available in four sizes—4", 6", 8", and 10". Prices and particulars are yours for the asking.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

Using a special rotary fixture, the Le Roi Company taps Class 4 threads in one operation on a Warner & Swasey No. 12 Precision Tapping and Threading Machine.

CLASS 4 THREADS AT ONE PASS!

AND SCRAP LESS THAN 1%

ONE stage of production at the Le Roi Company, West Allis, Wisconsin, manufacturer of industrial gasoline engines, calls for an important and highly accurate tapping job on crankshaft flanges. The ½-20 thread calls for a Class 4 fit through a 9/16" flange. Under former methods—a rough tap by machine and then finish by hand—up to one crankshaft in every ten was scrapped.

Today, by installing a Warner & Swasey No. 12 Precision Tapping and Threading Machine, Le Roi has cut scrap losses to the vanishing point (less than 1%). This accurate machine taps the Class 4 fits in a single operation, and eliminates all costly handwork.

Before the war, it would have been considered impossible to cut Class 3, 4, and 5 threads consistently by machine alone. Today, the results at the Le Roi Company bear out the experience of plant after plant in proving that Warner & Swasey Precision Tapping and Threading Machines set new standards of accuracy.

If you have a tough tapping or threading job, in hard or soft metals or plastics, let a Warner & Swasey Field Engineer show you how a Precision Tapping and Threading Machine can help you cut scrap losses, get better production and make more profits. Or write Warner & Swasey direct for a catalog describing all four models.

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

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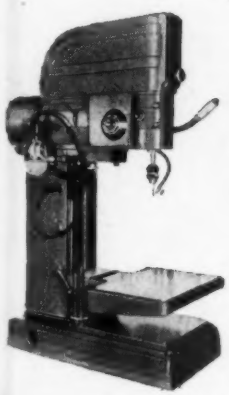
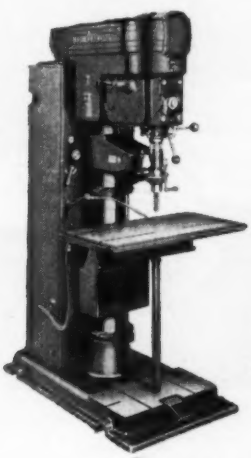
TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES

No. 10, Capacity 0-80 to 10-24



No. 11, Capacity 8-36 to 7/8"

No. 12, Capacity 3/8" to 2½"



No. 11R, Radial Capacity 8-36 to 7/8"

THE CARPENTER STEEL COMPANY • 109 W. Bern St., Reading, Pa.

How To Make Your Tools & Dies Produce EXTRA Pieces On Each Job...

Getting tools and dies that produce more pieces on each set-up isn't a matter of luck. Here's a practical way to get *extra output* from each tool by reducing machine down time. Use this 3-step *job analysis* plan to save money in tool making, heat treating and all along the production line.

1. Plan Tool Performance at the Start!

Here is a tried and proved way to get the extra output you want from your tools. With the Carpenter Matched Set Method you can actually plan tool performance before tools are made. For example, when you need greater toughness or more wear resistance in a tool, the Matched Set Diagram points to the tool steel best suited for the job. To cash in on its advantages ask for the 167-page Matched Tool Steel Manual. Its handy index quickly shows the way to the proper tool steel to meet your needs. For your free copy, drop us a note on your company letterhead.

2. Follow Up With Heat Treating "Know How!"

You know that proper heat treatment will back up your work in making tools that stay on the job. And here is how Carpenter can help you get better heat treating results. The Carpenter Heat Treating Guide provides complete, correct heat treating information in easy-to-use form. It gives you forging and normalizing heats, annealing and hardening treatments, recommended drawing ranges for all of the Matched Tool Steels. It gives tips on quenching, drawing and furnace atmospheres. For tools that will stay on the job longer and produce extra pieces, ask for your free Heat Treating Guide.

3. Check Each Tool's Output on the Job!

How many pieces does it produce between grinds? Did it fail too soon in service? Answers to those questions give you a yardstick to use in boosting output from each tool. Start today to check tool and die performance for more output, lower costs. And whenever you want personal help with a tooling problem, call your nearby Carpenter representative. He'll be glad to work with you.

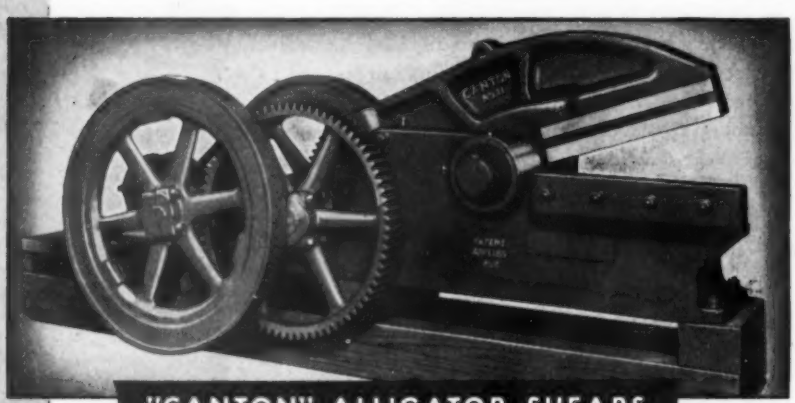
Carpenter MATCHED TOOL STEELS

BRANCHES AT
Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis, New York, Philadelphia, St. Louis

HILL TOOLS FOR

"HILL" SURFACE GRINDERS

"HILL" Heavy Duty Hydraulic Surface Grinders are manufactured in two "Companion" types — Horizontal and Vertical Spindle. Both styles are *"Open Side"* design, affording convenience and accessibility to the work in process, and featuring Massive Construction . . . 100% Hydraulic Table Drive — Built-in Spindle Motor — Centralized Controls — and Permanent Accuracy. Vertical Grinders furnished in table widths 18", 24", and 30". Horizontal Grinders furnished up to 36" wide. Table lengths range from 60" to 240".



"CANTON" ALLIGATOR SHEARS

For years the "Canton" Shear has been the most practical and efficient machine for processing industrial scrap. Available in all sizes, — Right or Left Hand, — High or Low Knife design.

"CANTON" PORTABLE CRANES

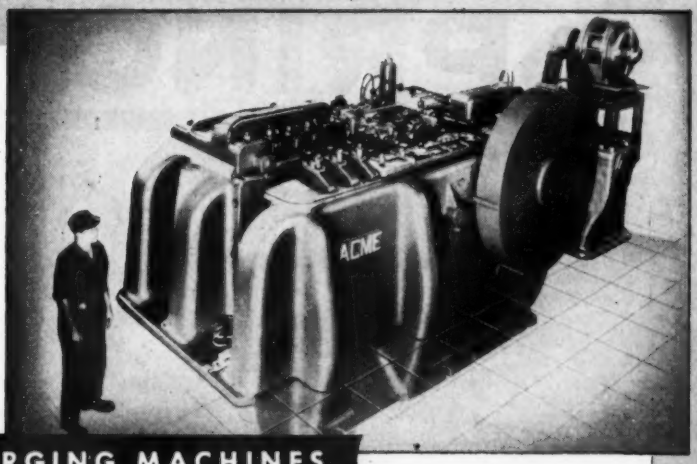
Fabricated Steel Portable Floor Cranes of modern design. The handiest tool in the Shop. Made in eight sizes, one to three ton capacity.

The HILL ACME C

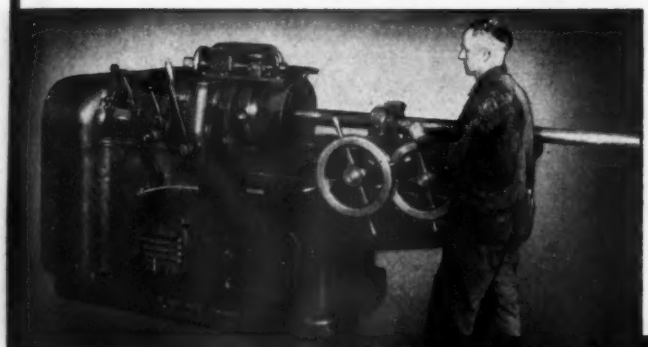
PLANTS AT 6400 BREAKWATER AVENUE, N. W. A

ACME INDUSTRY

"Acme" XN Forging Machines are of sound and proven design, incorporating rigid construction throughout, and simplicity of operation. They are available in ten sizes ranging from 1" to 5½" inclusive.

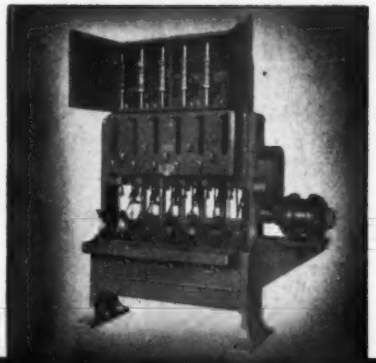


"ACME" FORGING MACHINES



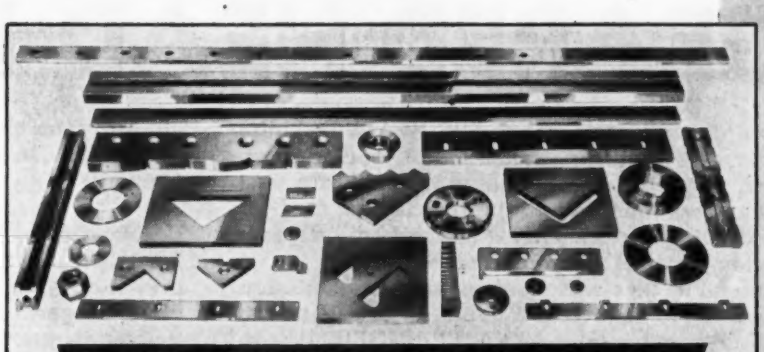
Single and Double Spindle "Acme" XL Threading Machines are equipped with the "Acme" tangent die head insuring economical and accurate high speed production. Furnished in sizes from 1" to 3" capacity.

"ACME" THREADING MACHINES



"ACME" TAPPING MACHINES

A complete line of semi-automatic Tappers for accurately threading nuts and pipe couplings.



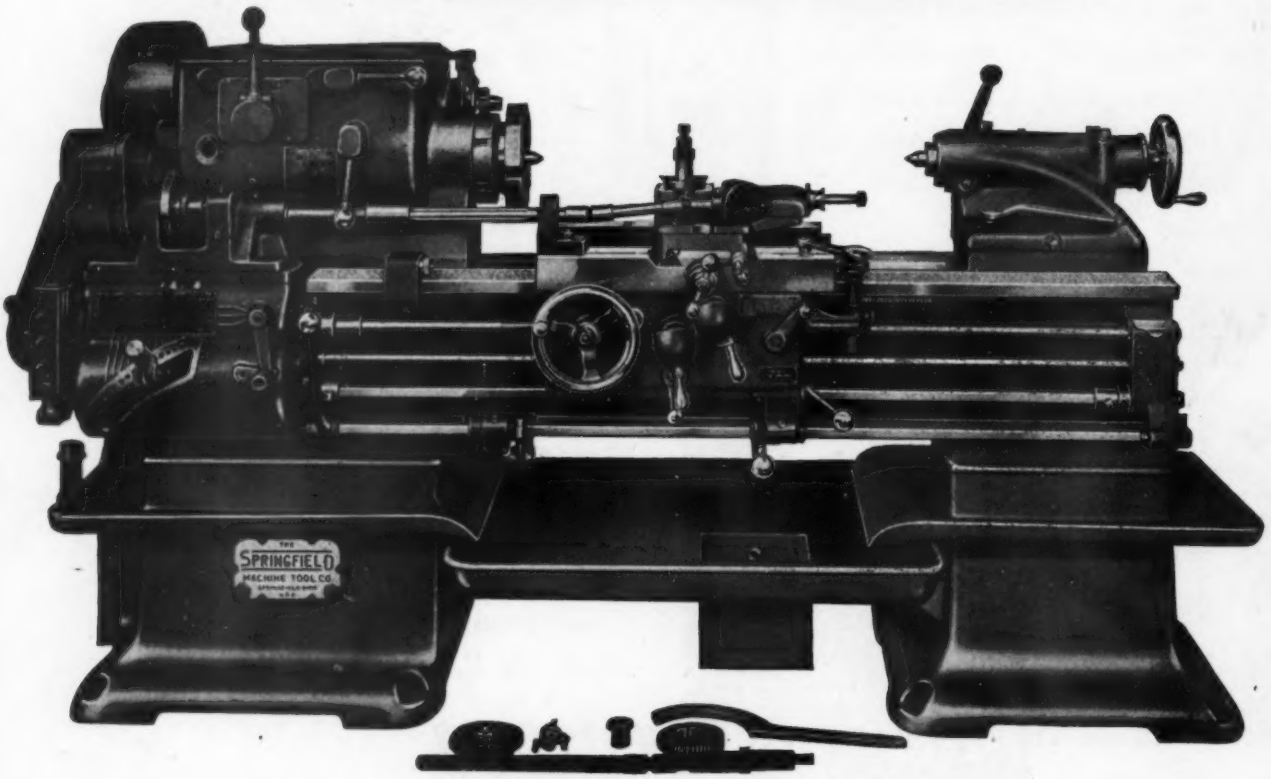
"CLEVELAND" KNIVES AND SHEAR BLADES

Solid and Laid Steel Shear Blades • • • Rotary Slitting and Side Trimming Knives • • • Metal Cutting Machine Knives, and Knife Sharpening Service.

E COMPANY *Cleveland 2, Ohio*

V. AND 4533 ST. CLAIR AVENUE, N. E.

Choose SPRINGFIELD



GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own foundry . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELD can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

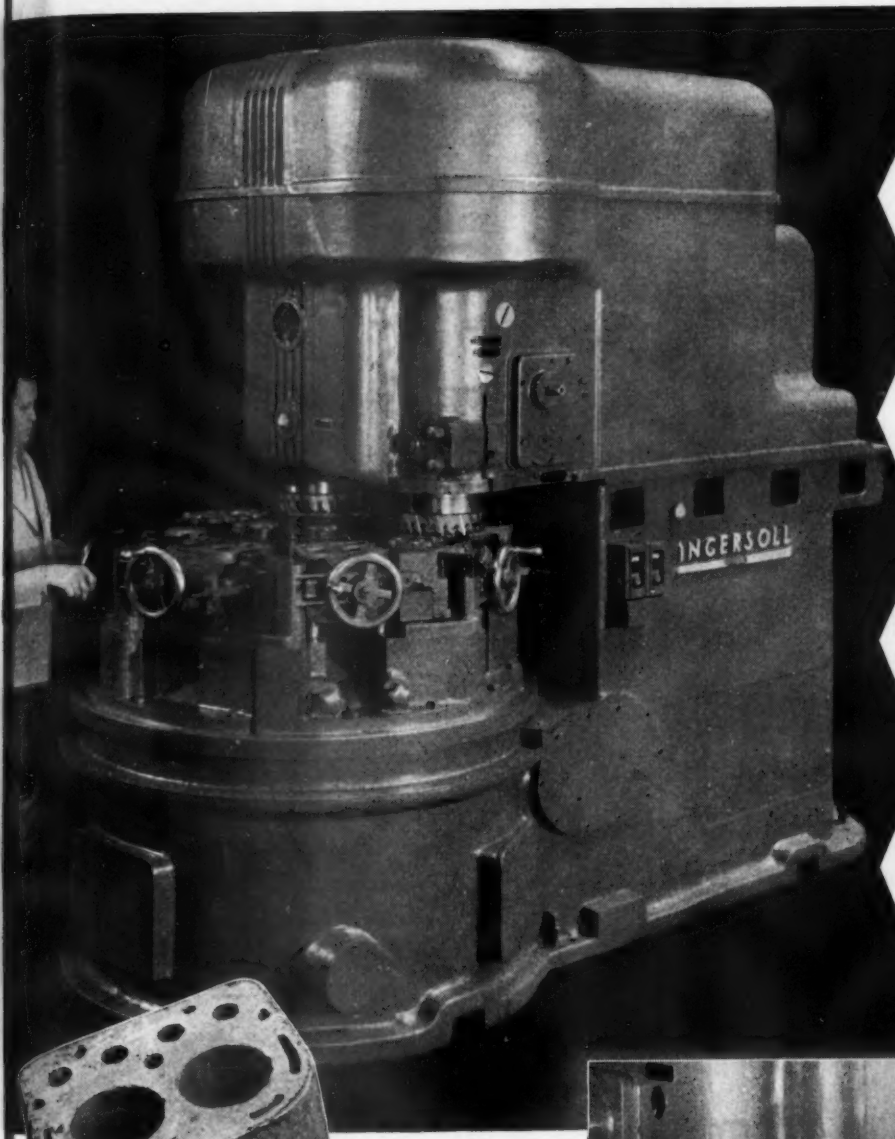
Under current emergency conditions make it SPRINGFIELD Geared Head Lathe . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

INGERSOLL SPECIAL MACHINERY

A Recent Example

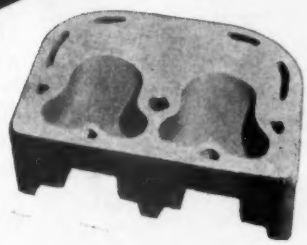


That Replaced 4 Old Machines

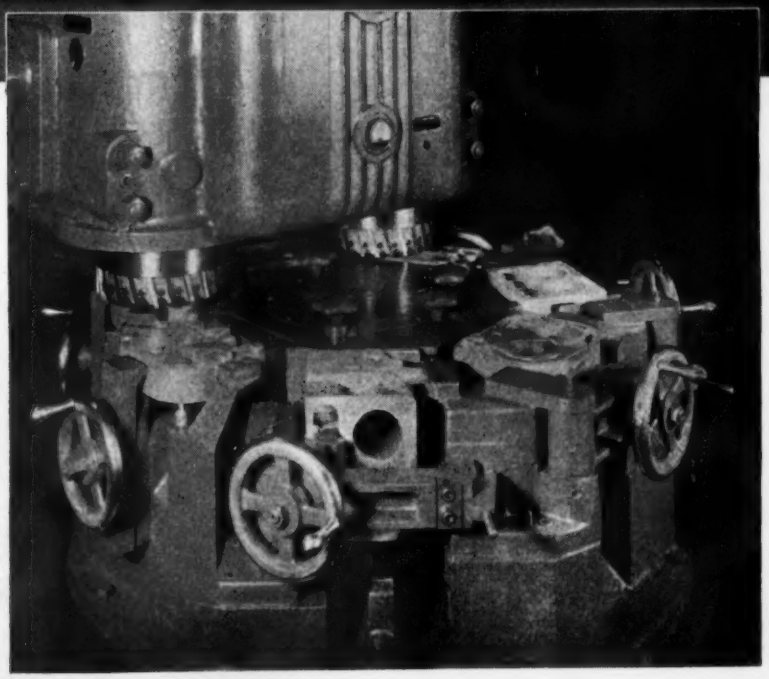
Increased Production 50%

Included a Finishing Cut for Greater Accuracy

At Less Initial Cost Than New Standard Machines



2 Spindle Rotary Machine Continuous Milling All Surfaces on Small Cylinder Blocks and Heads.



INGERSOLL

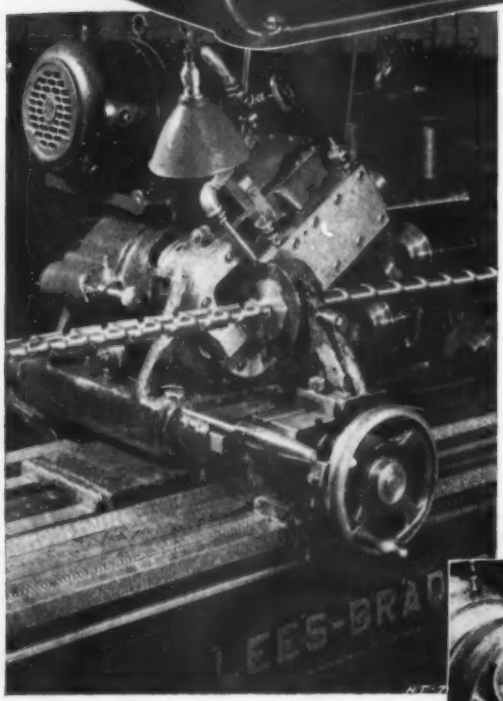
THE INGERSOLL MILLING MACHINE CO.

ROCKFORD, ILLINOIS, U.S.A.

LEES-BRADNER

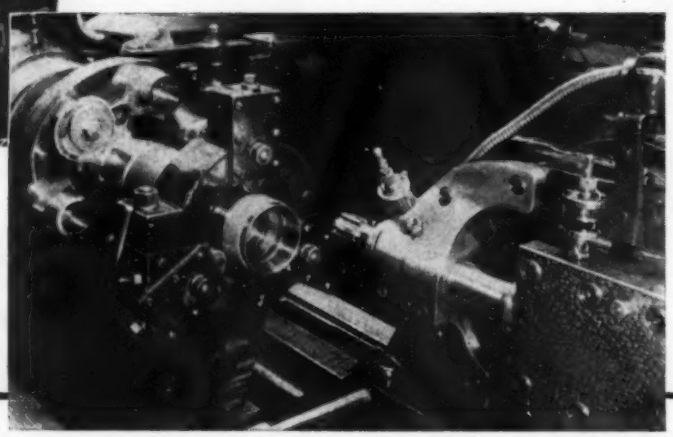
HEAVY DUTY THREAD MILLER

● This Heavy Duty Thread Miller is suitable for internal or external thread milling using either a disc or a ring type cutter. It combines in a single machine processes which previously necessitated two and often three machines. Due to its inherent ruggedness feeds and speeds far in excess of previous practice are possible. The result is particularly accurate threads in considerably shorter time with resultant lower cost. Ask for Bulletin.



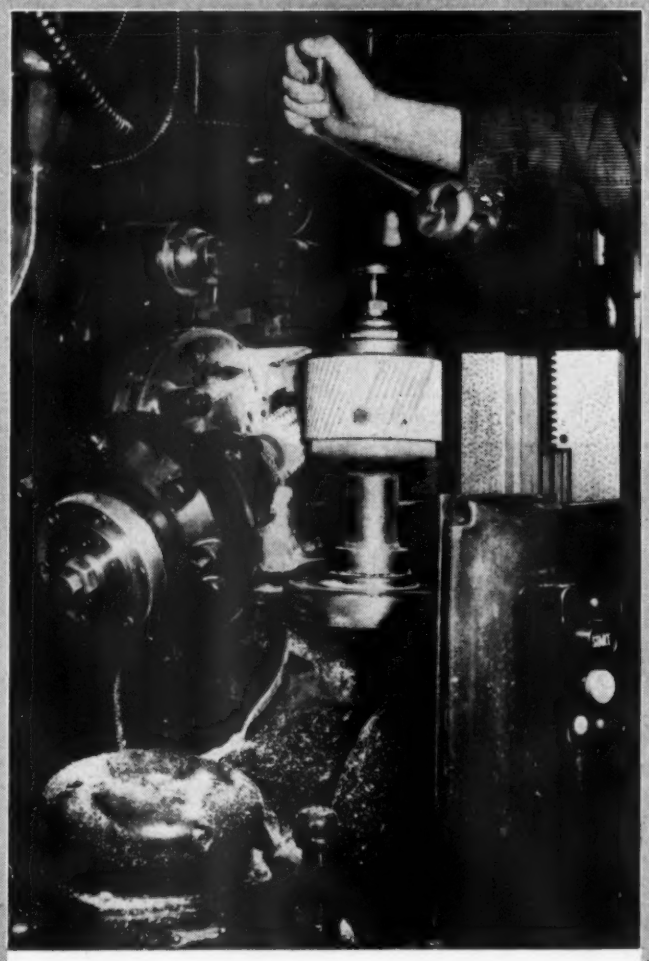
Above—Lees-Bradner Heavy Duty Thread Miller generating right-hand thread on a Rapid Traverse Screw for a well-known lathe manufacturer.

Right—Lees-Bradner HT Threading Machine milling an internal thread on the propeller shaft of a radial aircraft engine.

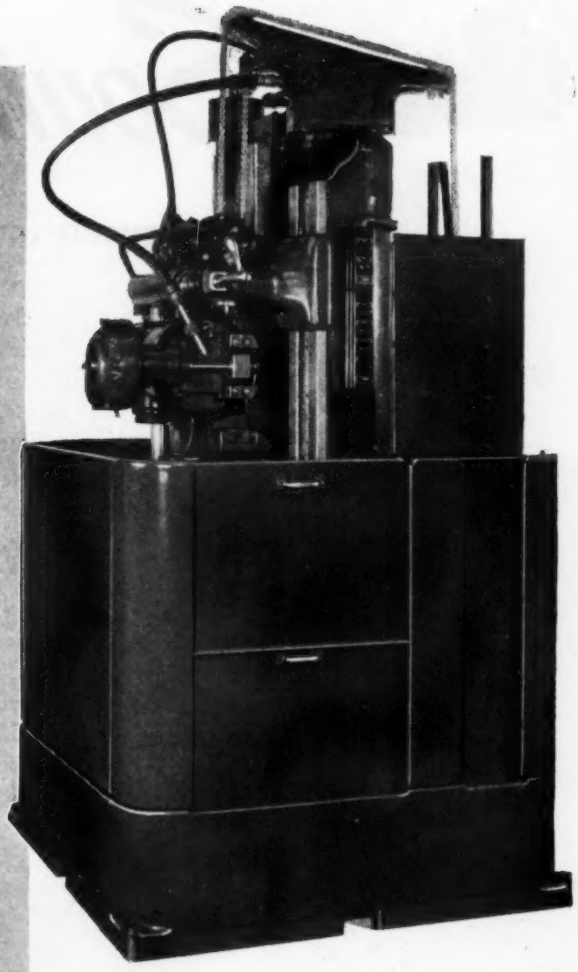


The HT Thread Miller is available in several lengths, has a diameter capacity of 12" and will handle work up to 2½" circular pitch.

7-A SINGLE SPINDLE *Automatic* PRODUCTION HOBBER



● The Hobhead on the Production Hobber arranged for quick, accurate axial shifting of the hob, incorporates a new unit: the entire back gear ratio is contained in the swivel head. Since all the reduction is so taken, chatter and back lash, already reduced by hob spindle bearing construction is further minimized.



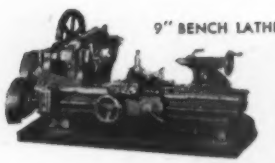
● This sturdy, automatic, high production machine will cut straight or taper serrations, spline shafts, spur gears, worm wheels, helical gears—right or left hand and angles up to 45 degrees. It will take gears up to 7″ OD and 9″ face and pitches up to 4 diametral pitch in steel.

It is extremely easy to operate and with relatively unskilled labor. Operator merely loads machine and presses start button. All functions of machine are automatic including accelerated back off and automatic stop at completion of cycle.

For precision gear and spline work, at high production rate and at low costs put the job on a Lees-Bradner 7A Production Hobber. Furnished in Single Spindle and Rotary models in 4-6 and 8 spindles.

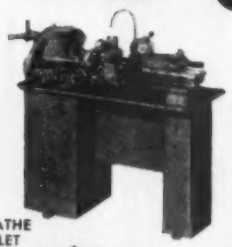
The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



9" BENCH LATHE

South Bend Lathes

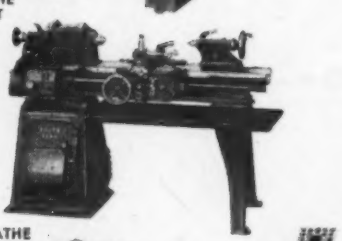


TURRET LATHE
½" COLLET

ENGINE LATHES - TOOLROOM LATHES - TURRET LATHES

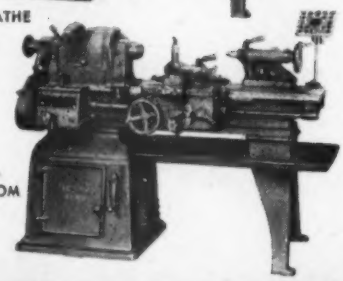
South Bend Lathes are built to meet the demands of modern industry. Their dependable precision and ease of operation simplify difficult, close-tolerance jobs. Their versatility, plus a complete line of practical attachments, make them equally popular for manufacturing, toolroom, and maintenance work.

New features include a headstock with improved bearings and super-finished spindle, easy reading graduated collars, precision-fitted dovetail slides, and a powerful multiple disc friction clutch in the apron. Quick change gear equipment provides 48 pitches of screw threads, 48 power cross-feeds, and 48 power longitudinal feeds.



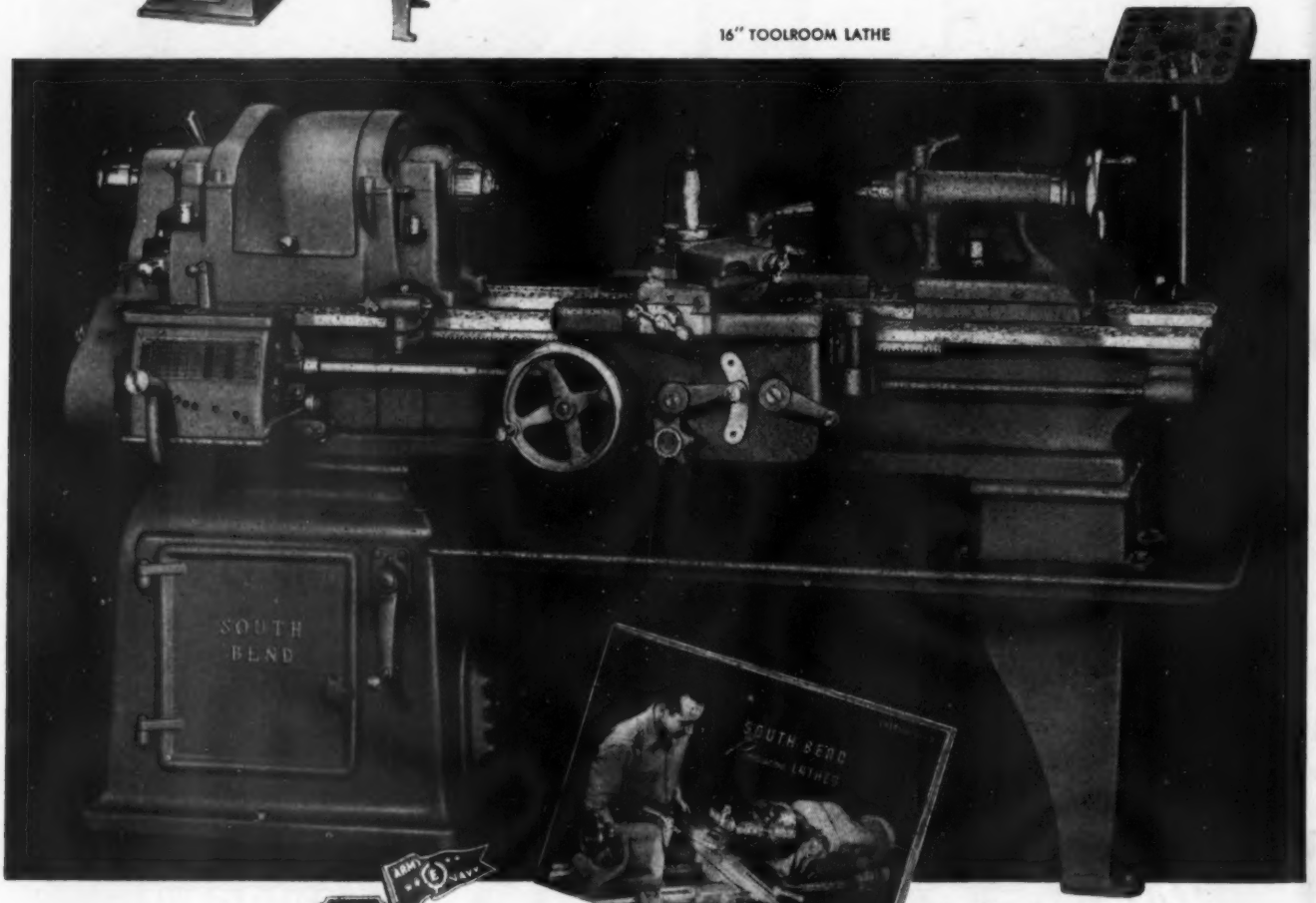
13" ENGINE LATHE

South Bend Engine Lathes and Toolroom Lathes are made with 9", 10", 13", 14½", and 16" swings and 3' to 12' bed lengths. The Precision Turret Lathes are made in two sizes: ½" collet capacity with 9" swing and 1" collet capacity with 10" swing. They are all illustrated in our new catalog described below.



14½" TOOLROOM LATHE

16" TOOLROOM LATHE



SOUTH BEND LATHE WORKS

419 EAST MADISON ST., SOUTH BEND 22, IND. • *LATHE BUILDERS FOR 38 YEARS*

Write **FOR THIS NEW LATHE CATALOG**

Contains full information on all South Bend Lathes—68 pages of specifications and illustrations (full-color) of lathes, attachments, and construction features.

The need for "knack" went out...

When DYNETRIC BALANCING* came in!

Yes, the old "tricks of the trade" are out of date where static and dynamic balancing is done. Today, with the Gisholt Dynetrics, the *machine knows all the tricks!* Now, even inexperienced personnel can balance rotating parts more quickly, more accurately than the best specialist could ever have done it by any other means.

GISHOLT DYNETRIC BALANCING MACHINES* take advantage of modern electronics to eliminate unbalance. As swift as they are accurate, these machines not only *locate* the source of unbalance but *measure* it as well. The operation is reduced to a simple dial reading. The required corrections are clearly indicated.

Gisholt Dynetric Balancing Machines are available in various sizes and types to accommodate any rotating assembly from ½ ounce up to 50 tons. They have put balancing on a low cost and a mass production basis. Any product which uses rotating parts needs this protection against destructive vibration. Literature on request.

GISHOLT MACHINE COMPANY
1201 E. Washington Avenue • Madison 3, Wisconsin

Look Ahead
Keep Ahead
With Gisholt

GISHOLT

**A development of Westinghouse Research Laboratories.*

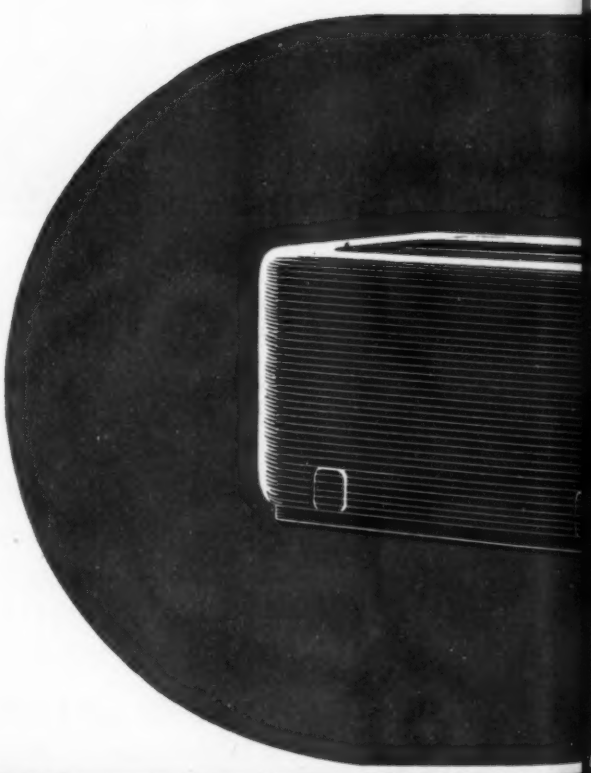
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Fully Automatic

Reduces cost of line boring the main crankshaft bearings in diesel engine crankcases

This Cross Special machine is fully automatic, requiring only a minimum of skill to operate—after loading, the operator merely pushes a button—the boring bar advances to cutting position, the work lowers and is clamped on locating pads. The boring head then drives the bar to complete the cutting operation, all elements automatically returning to starting position. Production rate is 20 pieces per hour at 80% efficiency.

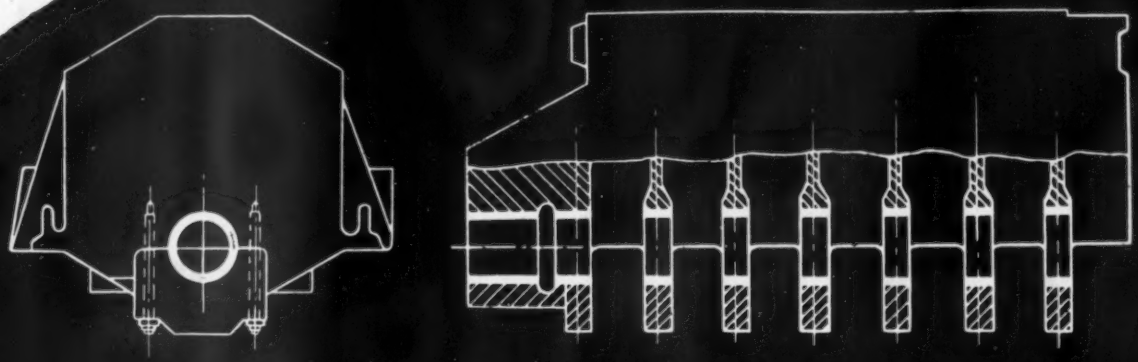
This is but one of a long list of metal-cutting jobs performed on Cross Special Machines. Many manufacturers are finding in them the soluton for realizing profit in the post-war market ahead. A preliminary study will reveal their possibilities on your work. Just write THE CROSS COMPANY, Detroit 7, Mich., Dept. 171.



CROSS

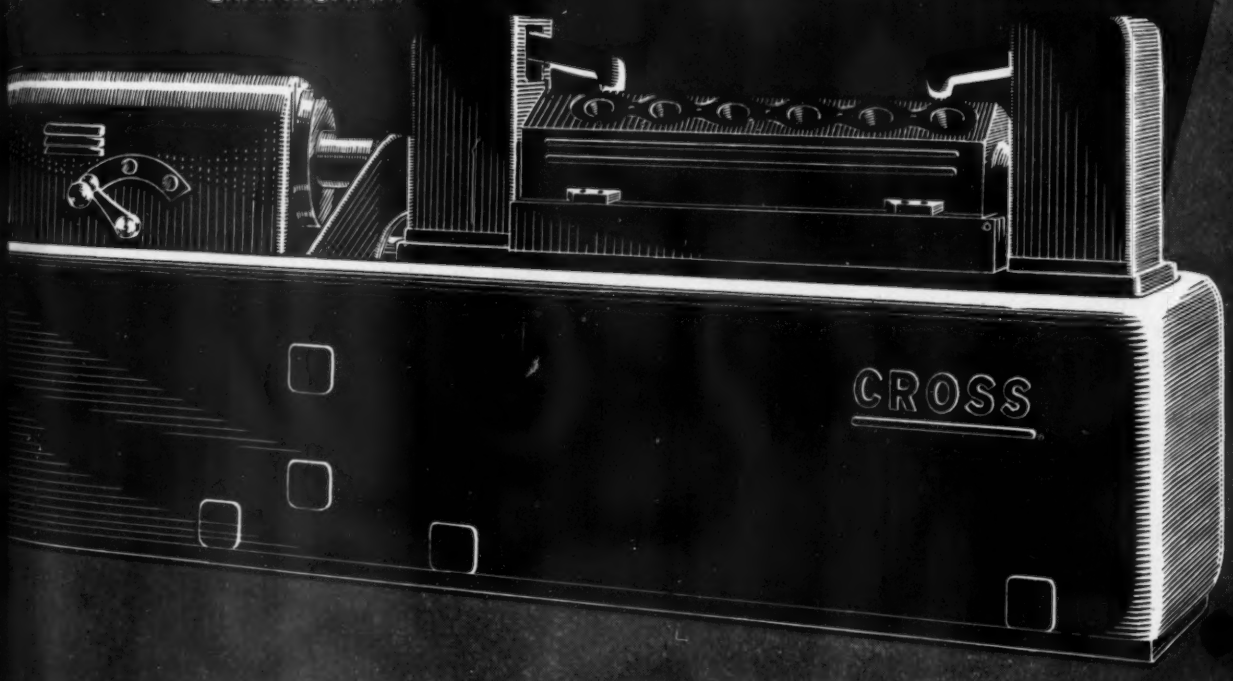
New York • Chicago • DETROIT • Cleveland • Cincinnati

PRECISION BORI



LINE BORING MAIN BEARINGS AND MAIN BEARING LINERS FOR CRANKSHAFT

20 PIECES PER HOUR AT 80% EFFICIENCY

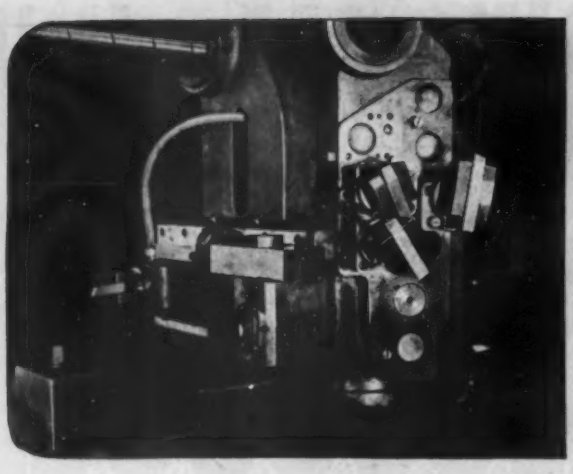


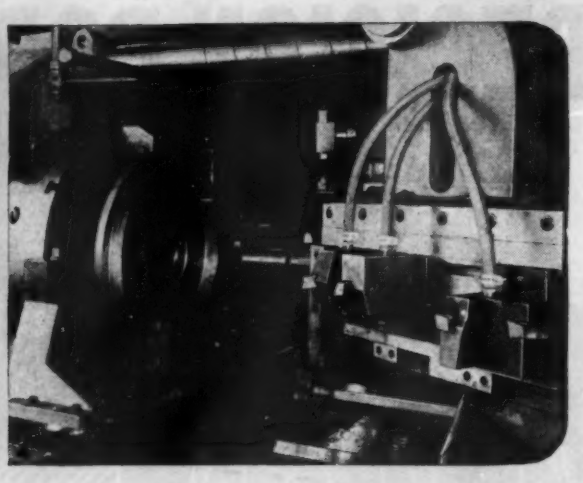
S-24

MACHINE TOOLS

SPECIAL MACHINES

for automatically performing any one or a combination of metal cutting operations
TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING





Your ORIGINAL INVESTMENT IN P & J EQUIPMENT INCLUDED RE-TOOLING POSSIBILITIES...

Take advantage of them—NOW!

Aside from the capacity of the machine, there are no practical limits to the variety of work that can be handled on P & J Chucking Equipment. Flexibility in tooling, with ample power to back up heavy cuts, is an advantage inherent in P & J equipment, which can readily be taken advantage of at any time.

When the 8 DXT P & J Automatic Chucking Machine illustrated here was purchased, a special tooling set-up was designed and furnished for machining flywheels. However, without changing basic outstanding features and performance, this machine can be re-tooled to handle other work.

P & J owners purchased re-tooling possibilities when they invested in P & J Equipment. Now, with re-conversion in the offing, is an opportune time to re-tool and obtain extra dividends on the original investment. Ask P & J engineers for assistance.

POTTER & JOHNSTON MACHINE COMPANY

Pawtucket, R. I.

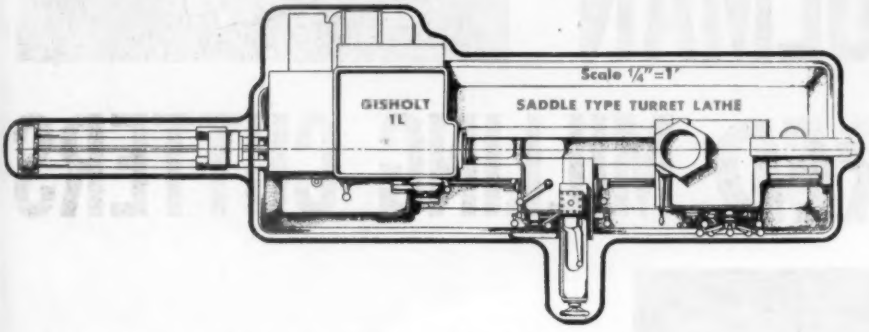
EVERY BOND YOU BUY IS AN INVESTMENT IN FREEDOM

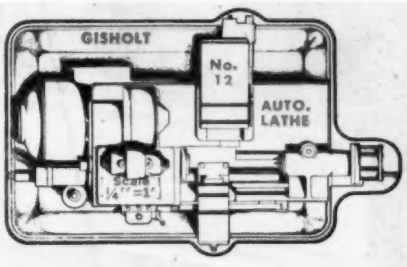
P & J REBUILDING SERVICE . . .

Your present P & J equipment can probably be restored to its original accuracy and productivity by rebuilding in our shop. It will pay you to investigate. Re-tooling can be handled conveniently at the same time.

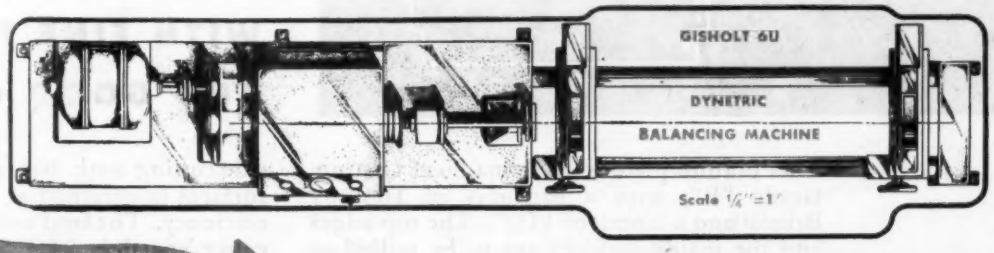
PLANNING NEW PLANT LAYOUTS FOR TOMORROW?

Gisholt is ready to assist with cardboard punchings for each size and type of Gisholt machine. These models—each made to exact scale—enable you to plan the location, or re-location, of machines by simply placing them upon your projected factory floor layout sheets to obtain the most efficient arrangement of machines, more easily. They are available, free of charge, upon request, to all companies preparing for reconversion to peacetime production. Use the coupon below.





The three diagrammatic cut-outs shown here represent the Gisholt 2L Saddle Type Turret Lathe, the No. 12 Hydraulic Automatic Lathe, and the 6U Dynetric Balancing Machine. Made precisely to ¼ inch to 1 foot scale, they eliminate the need for special trips to the shop to obtain accurate measurements of actual machines, or tedious checking of catalog specifications. Similar cut-outs are now available on all sizes and types of Gisholt machines.



USE THIS HANDY COUPON to request models desired

Be sure to indicate the quantity required for each size and type of machine. All requests should be directed to Madison.

GISHOLT

TURRET LATHES

AUTOMATIC LATHES

BALANCING MACHINES

SPECIAL MACHINES

GISHOLT MACHINE COMPANY

1201 East Washington Ave. • Madison 3, Wisconsin

Look Ahead—Keep Ahead—With Gisholt Improvements in Metal Turning

Gisholt Machine Company
1215 East Washington Ave.
Madison 3, Wisconsin

Gentlemen:

Please send me, free of charge, diagrammatic cut-outs of Gisholt Machines as indicated below. (Please state number required for each.)

__ No. 3 Ram Type Turret Lathe	__ Simplimatic (Automatic) Lathe
__ No 4 Ram Type Turret Lathe	__ No. 12 Hydraulic Automatic Lathe
__ No. 5 Ram Type Turret Lathe	__ 1S Dynetric Balancing Machine
__ 1L Saddle Type Turret Lathe	__ 3S Dynetr c Balancing Machine
__ 2L Saddle Type Turret Lathe	__ 3U Dynetric Balancing Machine
__ 3L Saddle Type Turret Lathe	__ 4½U Dynetric Balancing Machine
__ 4L Saddle Type Turret Lathe	__ 6U Dynetric Balancing Machine
__ 5L Saddle Type Turret Lathe	__ Dynetric Micro-Balancer

Firm Name . . . . . .

Street Address . . . . . .

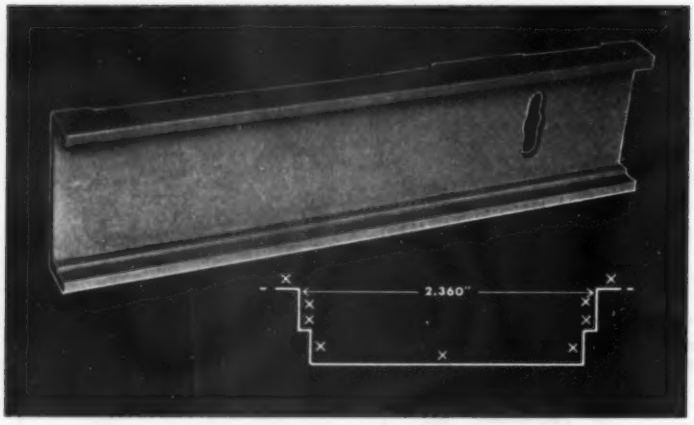
City . . . . . *State* . . . . . .

By . . . . . *Title* . . . . . .

SPECIAL GANG MILLING CUTTER

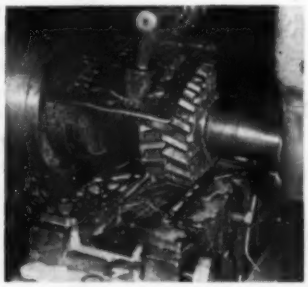
The two outside cutters are 5-1/16" x 5/16" Profile Form Cutters and the two inside ones are 5-3/8" x 2.190" Interlocking Type Side Mills.

BARBER-COLMAN *ENGINEERED* MILLING CUTTERS



STRAIGHT-SIDE SLOTTING AND MILLING ON NINE SURFACES IN STEEL CASTINGS, WITH FINE FINISH AND GOOD CUTTER LIFE

This bottom plate is an Arma Steel Casting, Grade "B", with a hardness of 163-207 Brinell and a length of 11¼". The top edges and the inside surfaces are to be milled as shown in the sketch above. Because of the stepped profile of the cut, this might have required several operations. However a gang of cutters was developed that finished all nine surfaces in *one cut.* This gang is shown in that picture at the top of the page and consists of two narrow profile cutters which finish the top surfaces, the upper inside surfaces, and the tops of the steps, combined with a pair of interlocking side mills which does the bottom surface and lower inside surfaces. By using side cutting teeth, better finish on the vertical surfaces is obtained as well as greater cutter efficiency. The feed used is 3⅝" per min. and cutter speed is 91.4 S.F.M.; chip load per tooth is .00279". Stock removed is approximately .012". Production is 15 pieces per hour or 1 every 4 minutes. At this rate the cutters deliver 700 pieces per sharpening and can be ground 15 times before they are used up, thus producing over 10,000 pieces per set of cutters. Compared with ordinary methods, this obviously shows a very reasonable tool cost and excellent production on a somewhat difficult job. *Let Barber-Colman Engineers help you obtain similar production and tool cost savings!*



BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

What is the only way human beings can turn out perfect products faster?

You're right! You're right! Now the $64 question: What organization has the engineers, the designers (with a spark of inventive genius), the tool makers, the equipment, the experience, and a fine reputation for doing what follows?

1. Designing dies, jigs, gauges and special tools that most accurately do jobs that have never been done before, or have never been done so fast and so well?

2. Building tools superlatively well?

3. Engineering the plant layout and production system to obtain the largest possible production in a given space?

Should you hesitate for an instant on this question, we'll give you a hint. Just write "Please send Vulcan's advertised literature". You will promptly receive the brochure "Vulcan Service to You in the Postwar World", and the broadside "What This Front Page News Means to You".

The VULCAN TOOL Co.

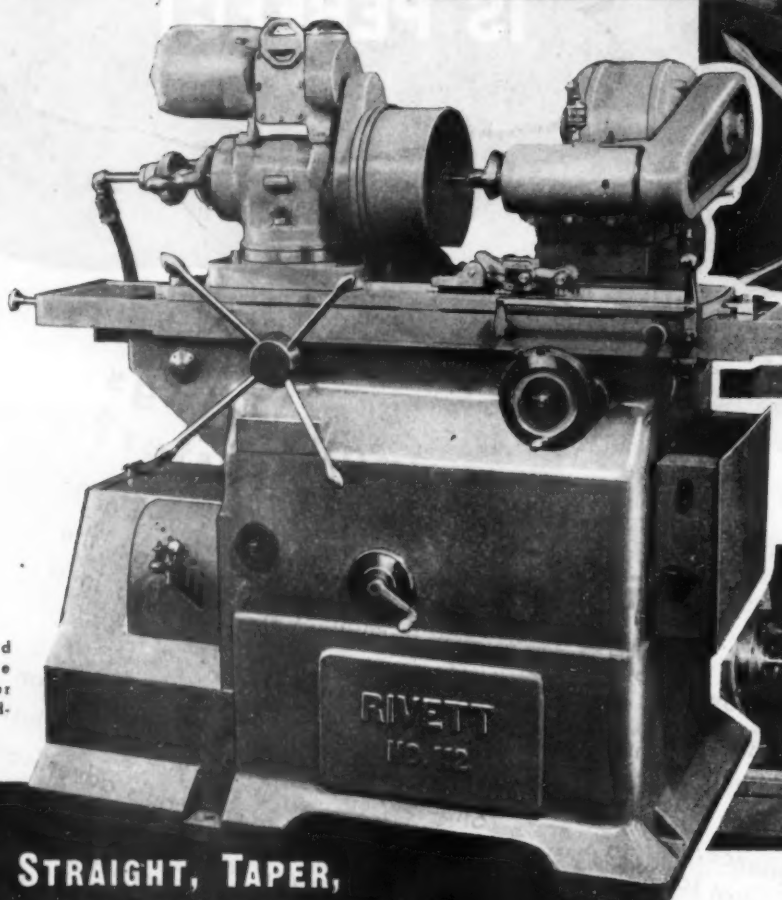
730 LORAIN AVE.,
DAYTON 10, OHIO

ENGINEERING · PROCESSING · DESIGNING
TOOLS DIES JIGS GAUGES SPECIAL

WRITE FOR THIS

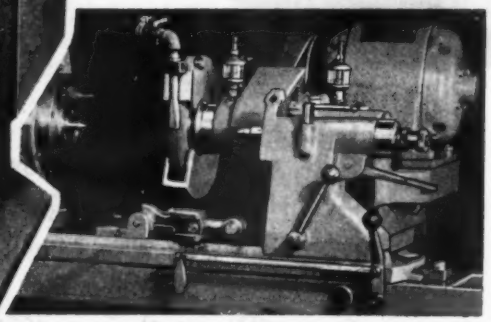
A MORE *Versatile* PRECISION GRINDER

RIVETT



Standard machine equipped for internal grinding.

Fine table feed with micrometer stop for shoulder and face grinding.



Bracket with spindle for external grinding and tail stock for mounting work on centers.

FOR STRAIGHT, TAPER, BEVEL OR STRAIGHT AND BEVEL GRINDING

The Rivett No. 112 Universal Grinder is primarily for tool room work. Internal and external spindles, in combination with many adjustments, make possible a greater variety of precision operations. Extreme simplicity of design assures easy and efficient operation by even the lay machinist.

SPECIFICATIONS

Grinding cap., hole dia.	1/8" to 8"
Grinding cap., outside dia.	up to 8"
Automatic table travel	1/2" to 3"
Table speeds	18 selective
Hand table travel	16"
Swing over table	14"
Workhead swivel	90°
Table swivel	5°
Cross slide swivel	90°
Cross feed graduations	.0005"
Travel of cross slide	3 1/2"
Collet capacity	1"
Step chuck capacity	8"
Jaw chuck capacity	8"
Workhead speeds	
Spindle	150-450 r.p.m.
Dead center	100-300 r.p.m.
Grinding spindle speeds:	
Internal	5000 to 25000 r.p.m.
External	3300 r.p.m.
Automatic Oil Lubrication	
Net weight with motors	3700 lbs.

RIVETT LATHE & GRINDER INC.

ARMY E NAVY

BRIGHTON BOSTON, MASS.

FIRST in War - FIRST in Peace

Out of the war comes this improved Federal Inch Type Series S ball bearing adopted by our armed forces for radar, fire-control, range-finders and artillery.

Prior to Pearl Harbor, these bearings were extensively used in all important industries. Then to meet the challenge of war, Inch Type Series S was improved and developed to the present high standard of efficiency.

This precision ball bearing has many advantages—light weight, high speed, can carry a heavy load—a top-flight bearing for top-flight service—FIRST in War, FIRST in PEACE and now—FIRST in the specifications of American manufacturers.

FEDERAL
BALL BEARINGS

FOR PRECISION PERFORMANCE, USE FEDERAL INCH TYPE SERIES S IN YOUR PLANT OR PRODUCT

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BALL BEARINGS
THE JEWELS OF INDUSTRY

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

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REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower—26 • Cleveland: 402 Swetland Building—15
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ASK A WESTINGHOUSE APPLICATION ENGINEER *NOW* HOW IT WILL BEHAVE ON YOUR MACHINE

Some design plans are foolers when it comes to motor application problems. What may seem perfectly logical in your planning stages may turn out to be a headache later. So, now is the time to double check your motor drive. Later, it may prove costly . . . may necessitate a specially-engineered motor.

Westinghouse standard small motors have been proved in thousands of applications. Numerous specialized designs have been developed to meet the requirements of particular applications. These standardized designs offer additional advantages in lower costs, speedier deliveries, reduced inventories and simplified servicing.

Westinghouse application engineers are ready to help you with your motor problems. Call your nearest Westinghouse office or write Westinghouse Electric Corporation, Lima, Ohio. J-03229

MOTOR EXCHANGE PLAN PROVIDES

REPLACEMENT SERVICE IN 24 HOURS OR LESS

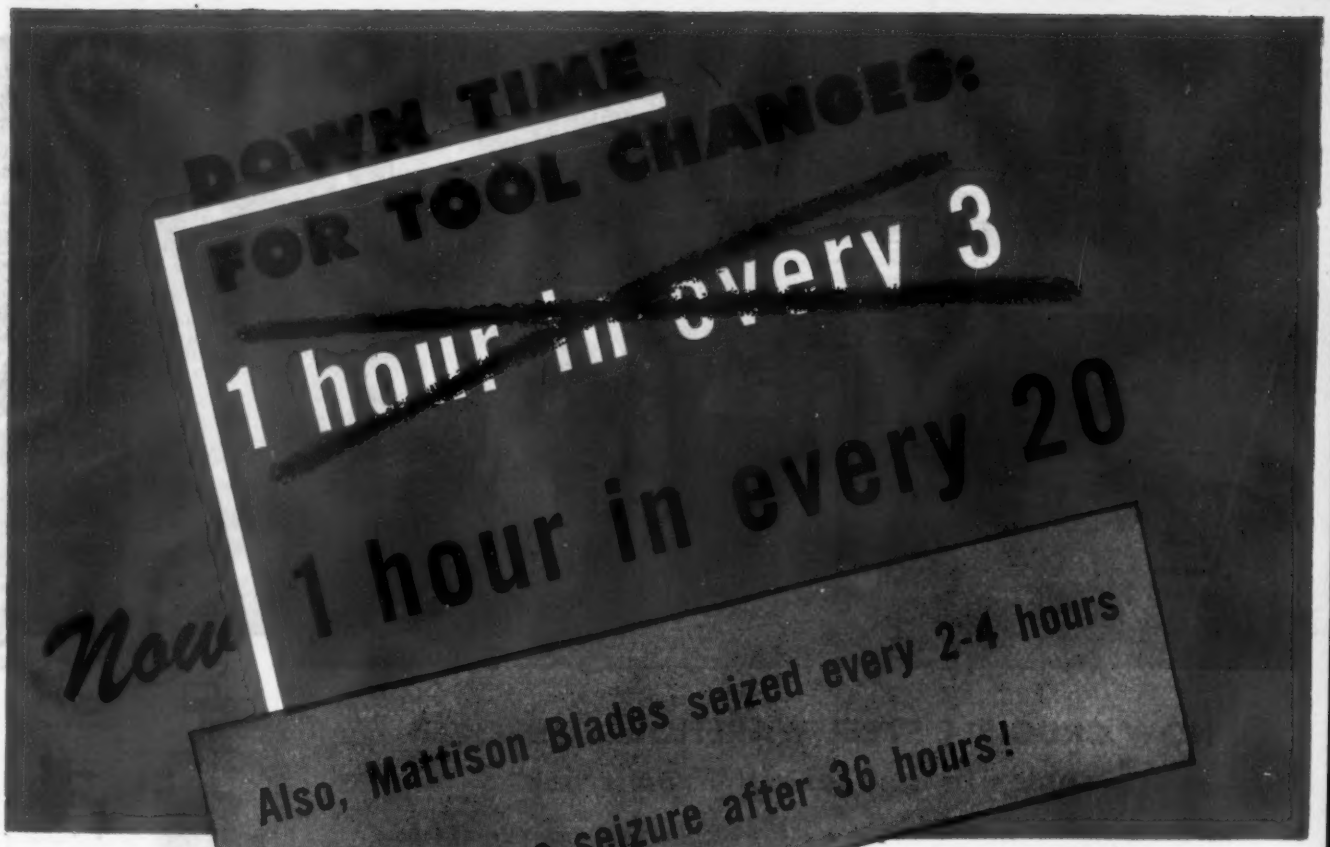
ANYWHERE IN THE UNITED STATES

Westinghouse Motor Exchange points in all principal cities can service most Westinghouse small motors of standard sizes in 24 hours, or less, anywhere in the United States. This service gives the appliance user an efficient, factory-rebuilt replacement motor in exchange for his old motor at a low, flat cost. Your nearest Westinghouse office will give you full details. Ask for bulletin B-3336.

WESTINGHOUSE

Westinghouse

SMALL MOTOR DIVISION


DOWN TIME
FOR TOOL CHANGES:
1 hour in every 3
Now 1 hour in every 20
Also, Mattison Blades seized every 2-4 hours
Now no seizure after 36 hours!

FINISH IMPROVED 30%

This was done on a 6 spindle Cone Automatic... after switching to QUAKER KUT #45—a new type organic base that replaces conventional cutting oils.

If you are interested in slashing down-time in your plant, a Quaker Process Engineer will be pleased to call and determine whether QUAKER KUT #45 can be adopted successfully in your machining operations. There will be no obligation or cost to you.

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name_____ Position_____

•••PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW•••

NOW CRUCIBLE STEEL WAREHOUSES DELIVER

—*any size, any length "from stock"*

With their modern high speed MARVEL Hack Saws the Crucible Steel Company's Warehouses can deliver orders "from stock," whether for a few miscellaneous lengths, a thousand alloy steel gear blanks, a single tool steel disc 18 inches in diameter, or other lengths or slices accurately cut-off from any type bar stock.

In their Indianapolis quick service Warehouse shown above they have two No. 9A MARVEL Automatic Bar Feed Sawing Machines (capacity 10" x 10") and one No. 18 MARVEL Universal Roll Stroke Hydraulic Saw (capacity 18" x 18"). The high speed 9A will cut-off identical pieces from single or nested bars automatically with no more operator attention than an automatic screw machine requires. They can be stopped at any point in a quantity run; a miscellaneous cut made; and the quantity run resumed by simply disengaging and reengaging the automatic feed. The No. 18 "Roll Stroke" Hydraulic Saw handles the heavy stuff—will quickly cut-off the largest and toughest bars.

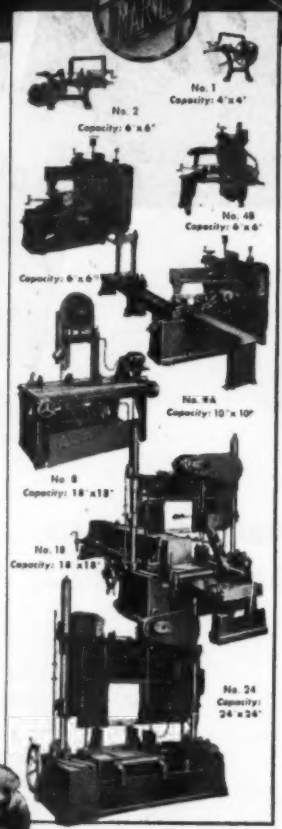
The Crucible Steel Company, like many others, have found the MARVEL Hack Saw method fast, accurate and economical; and that it requires no special skill on the part of the operator. For quick reference see our section in Sweet's File—Mechanical Industries or write for catalog.

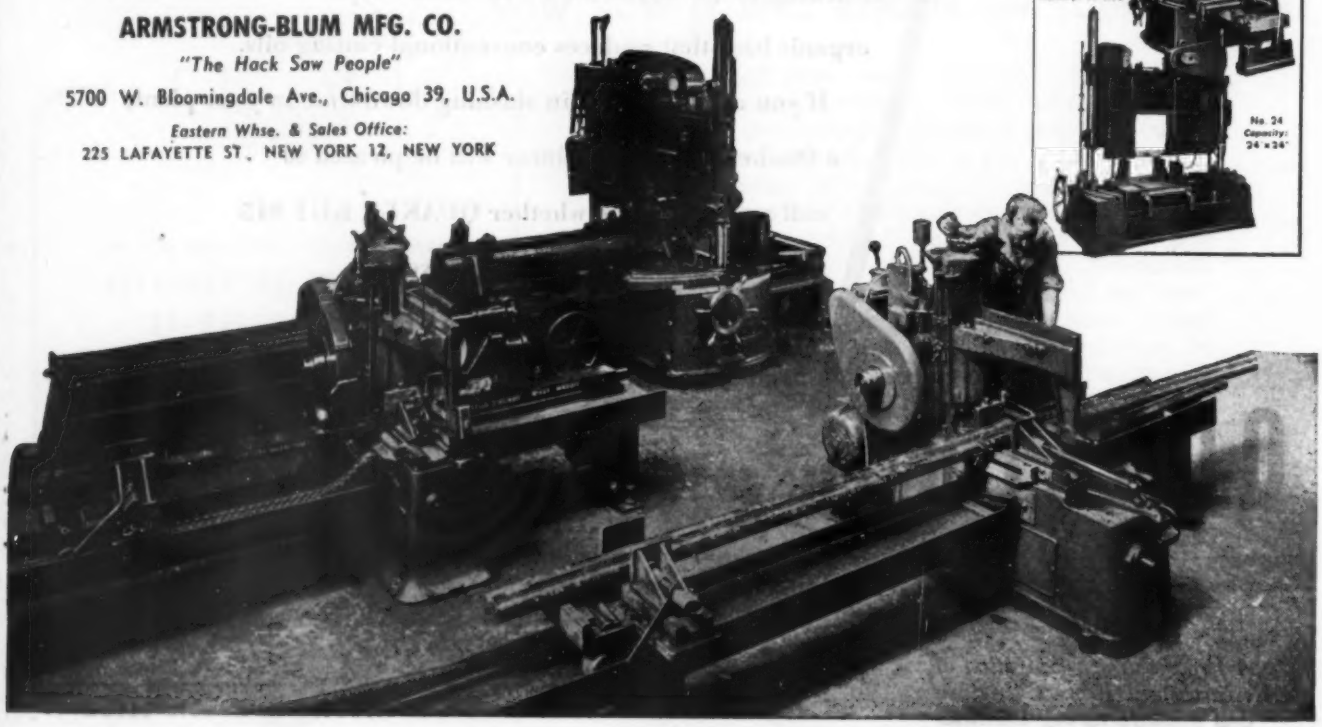
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

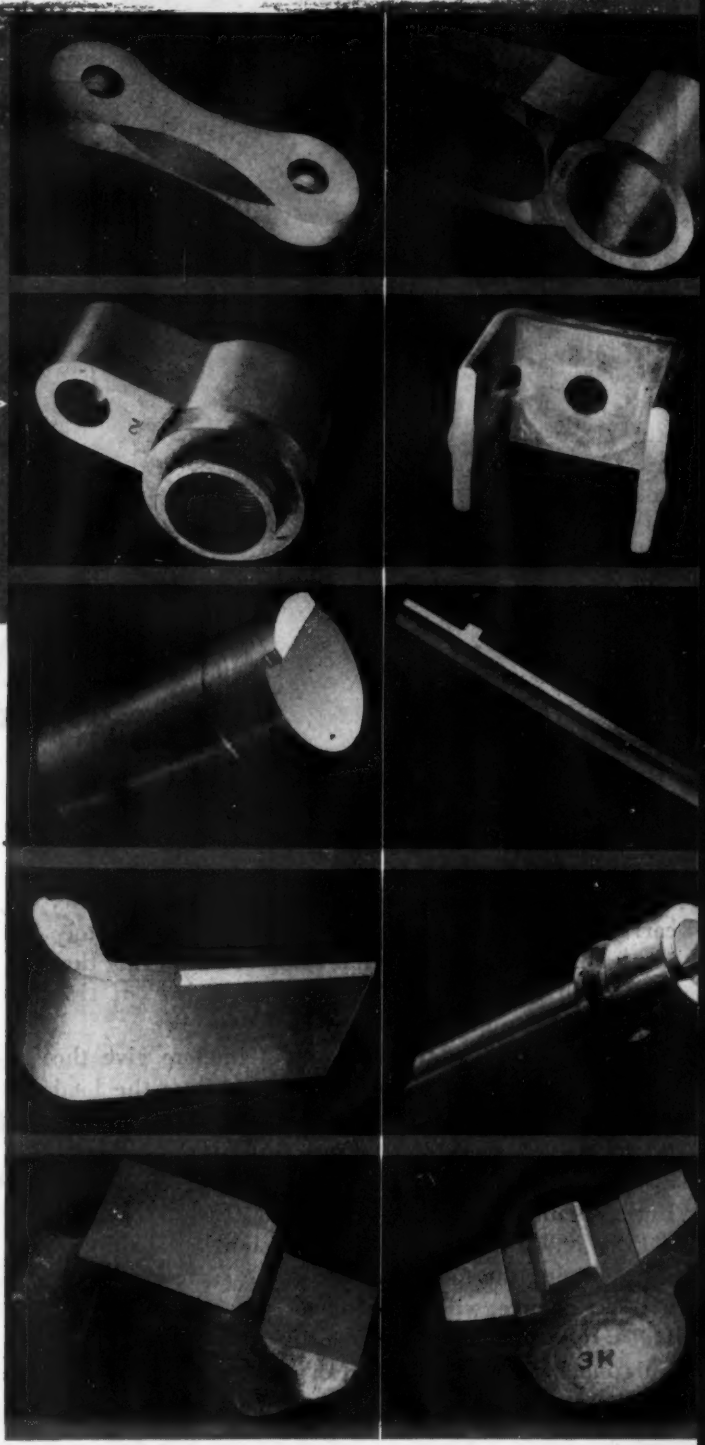
5700 W. Bloomingdale Ave., Chicago 39, U.S.A.

Eastern Whse. & Sales Office:
225 LAFAYETTE ST., NEW YORK 12, NEW YORK





a faster machining method

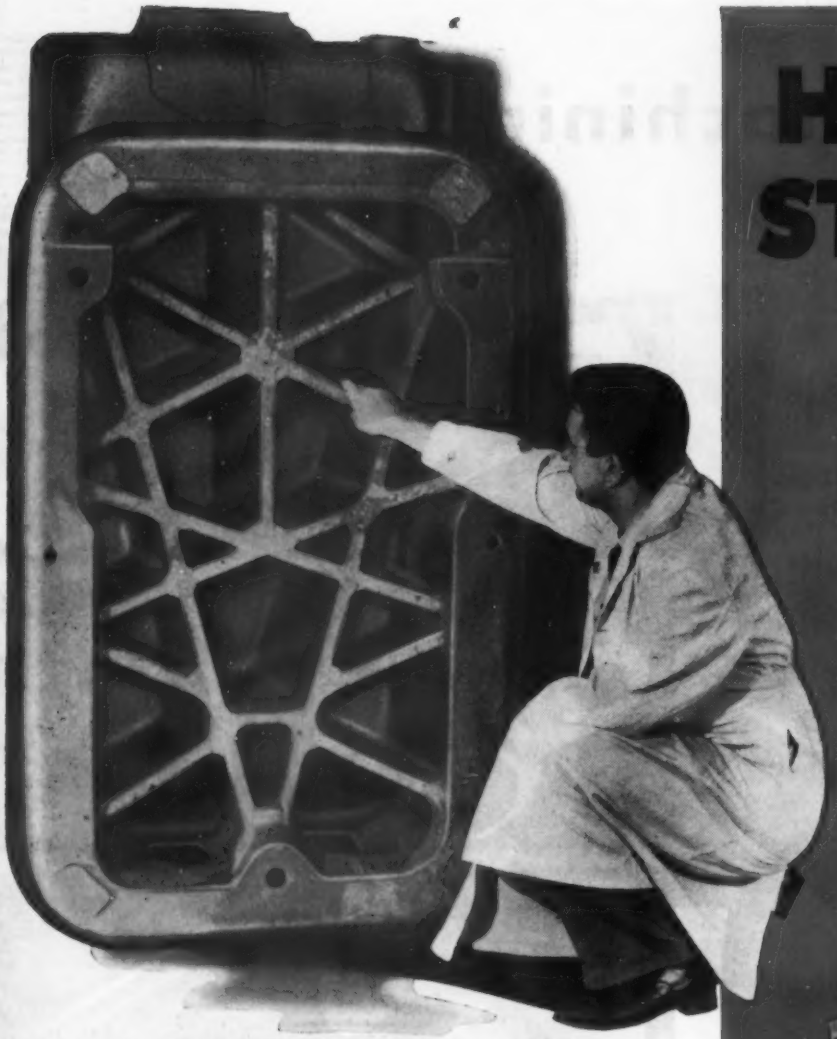


WITH reconversion, cost per piece is of primary importance in the machining of all metal parts. Surface broaching is now being used in many plants to produce work similar to these illustrations, with higher production per machine and lower tool maintenance cost than was possible with former machining methods. We will be glad to work with you on the possibility of applying surface broaching to your work. Just send blueprints of your parts with information on number of pieces per hour required.

THE FOOTE-BURT COMPANY
CLEVELAND 8, OHIO
Detroit Office: General Motors Building

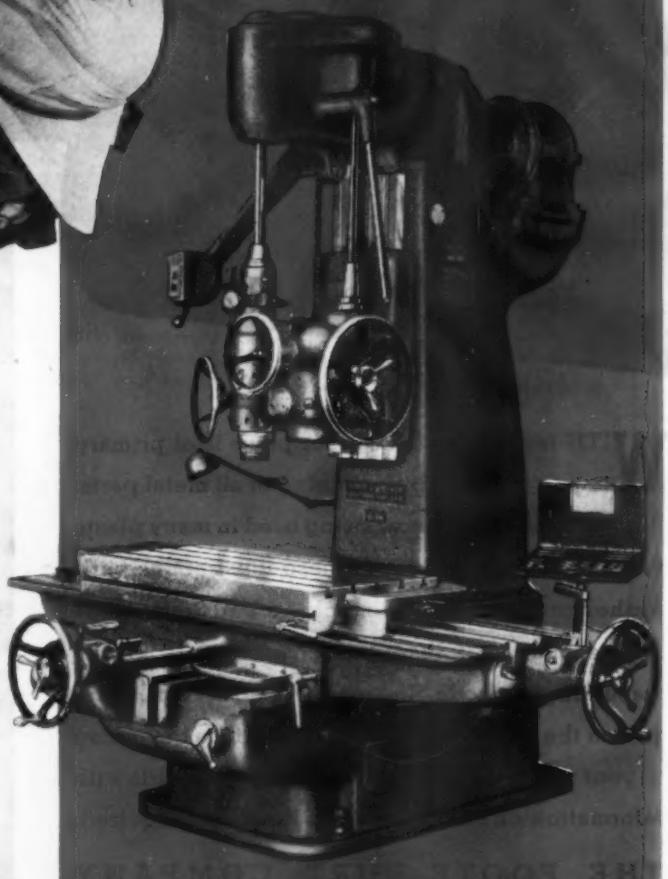
Footburt Patented Tooth Fo

FOOTBURT *Surface Broaching*



HIDDEN STRENGTH

This Picture Shows Another Reason Why a Pratt & Whitney Jig Borer Always Stays Put



Here's a view Pratt & Whitney customers seldom get. But it shows up a mighty important feature of the P&W Jig Borer — the web-like ribbing that is an integral part of the bed.

This machine carries a big load — column, table, carriage, and work — which it must support accurately in various positions. It is vital to precision boring that the machine *stay put*. That's the "why" of this unusual construction.

The ribbing is planned and designed to give the greatest support and stability exactly where the load requires it. It is one more example of the hidden quality that is responsible for Pratt & Whitney accuracy . . . one more reason why the performance of P&W Jig Borers is universally acclaimed.

Pratt & Whitney Jig Borer precision has "paid off" in producing the tools for war. These same machines, without change, will continue to "pay off" producing tools, jigs and fixtures for peacetime production. This machine is a "must" in every tool room. Ask us for literature.

PRATT & WHITNEY

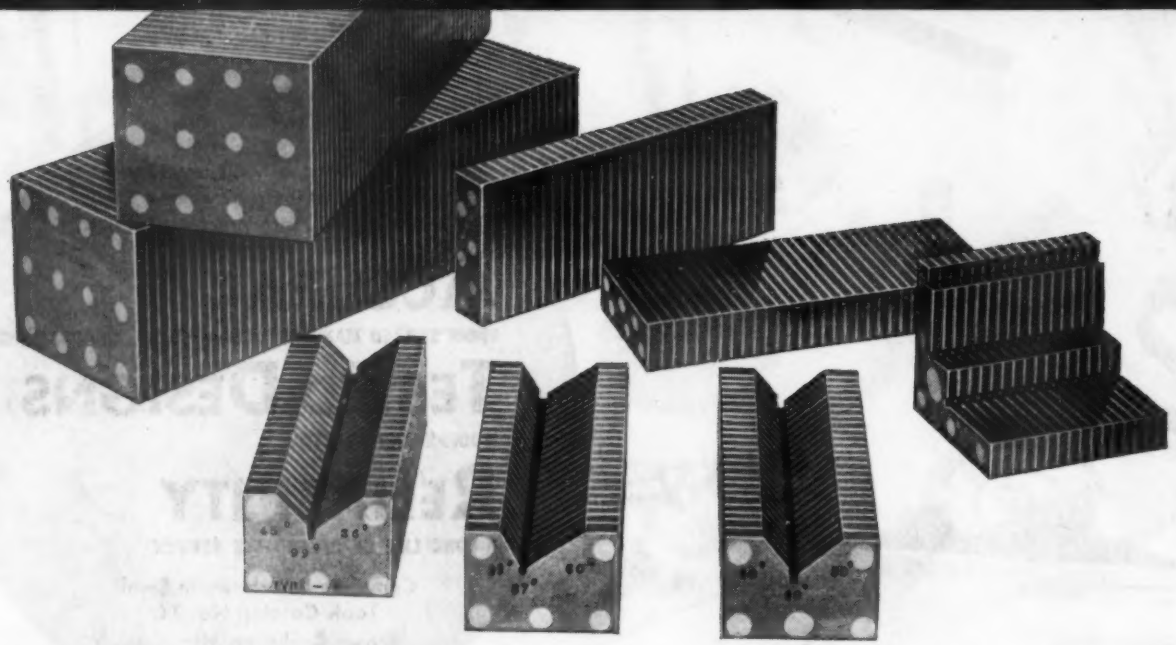
Division Niles-Bement-Pond Company

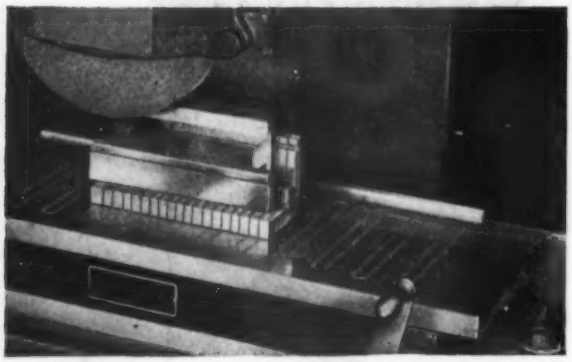
WEST HARTFORD 1 • CONNECTICUT

BROWN & SHARPE TOOLS

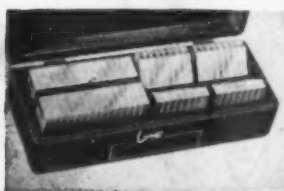
SCHERR MAGNE-BLOX

PARALLELS V-BLOCKS ANGLE IRONS





Part held at true vertical by Magne-Blox angle iron and two parallels. The magnetic principle of holding work is applied by the vertical side of the angle iron, as well as by the horizontal face of the chuck. The small laminations in the Magne-Blox transmit sufficient magnetic holding power to eliminate the need of clamps.



The universal set of Magne-Blox—two parallels, two V-blocks. Complete with case, $14.50

Set of toolmakers' matched angle irons, in case, $45.00

-- they transform magnetic chucks into special fixtures

Have you odd-shaped or small pieces to hold on surface grinders? Scherr Magne-Blox will serve as extensions of your magnetic chucks, enabling them to grip in spite of projections, difficult contours, curved surfaces, and to hold the work in the position required.

For instance, Magne-Blox angle irons permit of work to be held truly vertical, and at a vertical angle if desired, which can be accurately established with sine bar. Parallels in various dimensions, and V-blocks, can be combined to provide almost any holding contour to match the work. Available singly or in matched pairs, and in standard sets. Write for prices and full details.

Special Magne-Blox can be supplied, such as the V-blocks shown above, which are ground to special angles. Write for quotations.

GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

MARATHON ACCELERATED RESEARCH

sets the pace for peacetime solution of your cutting and grinding problems

Accelerated research at The Ohio Oil Company Laboratories met the war's most urgent demands by not only finding solutions but also by even anticipating cutting and grinding problems and having the answers ready . . . *in advance.*

That same step-ahead research will be continued during the peacetime years—

- to improve present cutting and grinding oils
- to anticipate cutting and grinding problems in advanced and improved machinery
- to create new oils that will solve problems which will arise in the production of new products
- to cut manufacturing costs by getting more work and better work out of cutting oils

The intensive, advanced research, which is one of the many reasons why The Ohio Oil Company is among the leaders in the industrial lubricant field, is research *for you.* It is practical investigation of better ways to help your plant do an improved job of cutting and grinding the varied and complicated products peacetime buyers will demand.

That's why it will pay you to keep in touch with The Ohio Oil Company, to ask for regular visits by a member of our greatly expanding field lubrication engineering staff. Just write, wire or phone.

A COMPLETE LINE OF CUTTING AND GRINDING OILS FOR EVERY METAL WORKING OPERATION

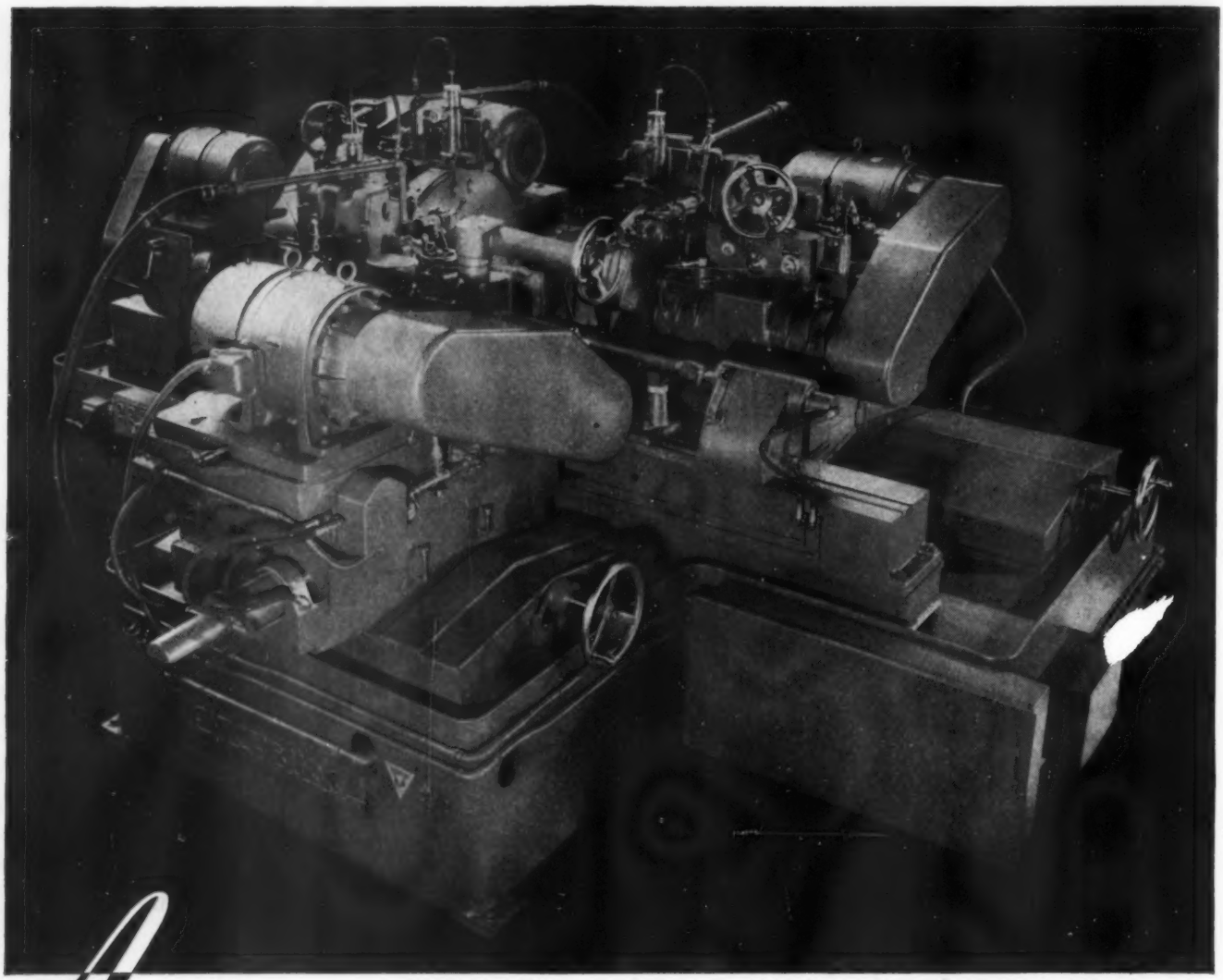
The OHIO OIL Company

Producers of Petroleum Since 1887

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

MARATHON



Again THREE HEADS ARE BETTER THAN ONE

. . . Because Fitchburg engineers have combined three standard Bowgage Grinding Heads on a special base to plunge-cut grind three spottings on a 96" torsion spring for tanks. All three dimensions are ground at the same time—and within the time of the longest single grinding operation — and in one handling, with the consequent saving in time and reduced danger of spoilage.

Get the complete facts. The open engineering mind instantly makes a favorable comparison between Fitchburg automatic precision grinding and any other equipment on the market! Install the Fitchburg method now and use your "Head" to cut costs and speed production.

Send your blueprints for our engineers' recommendations. There will be no obligation.

A triple-head Fitchburg Grinder like this may be converted into one double-head grinder and one single-head grinder, or three single grinders. Heads are interchangeable — save your investment.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U. S. A.
Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Soline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders

Now UP TO 2000 hp!

STANDARD 2000-HP TRI/CLAD MOTORS NOW AVAILABLE

THEY GIVE EXTRA PROTECTION 3 ways

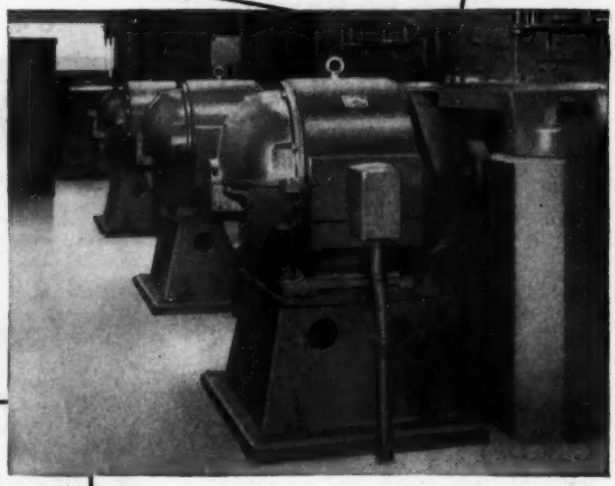
1 Extra protection from physical damage—Cast-iron construction. Upper portion completely enclosed. Streamline, cast-iron end shields. Corrosion-resisting finish.

2 Extra protection from electrical breakdown—Windings of Formex* wire, strongly bonded with oil- and moisture-resistant synthetic resins, stand up under abrasion or "heat-shock."

3 Extra protection from operating wear and tear—Sleeve or ball bearings, in dust-tight housings. Sleeve-bearing design is a further refinement of well-proved Tri-Clad bearing proportions, with cast-in "air seal" to further insure oil tightness of the housing.

The triple-protected construction that has made General Electric's Tri-Clad motor so popular in the small and intermediate sizes has now been extended to motors of 2000-hp capacity. On your *big* drives, these new Tri-Clad motors will meet severe conditions with greater assurance than ever of dependable service and long life.

The Tri-Clad motor, in its wide range of types and sizes, is industry's most popular integral-hp motor. Chances are there's a standard Tri-Clad to meet your requirements "on the nose." For information on G.E.'s complete line of Tri-Clad motors, ask for Bulletin GEA-3580. *General Electric Company, Schenectady 5, N. Y.*



Three of the new, large Tri-Clad motors, each rated 200 hp, 1200 rpm, driving coal pulverizers in a Southern steam-electric plant

*Trade-mark reg. U.S. Pat. Off.

HERE'S TODAY'S WIDER RANGE OF STANDARD SIZES	
TRI/CLAD Type K	—1 hp to 2000 hp at 1800 rpm
TRI/CLAD Type KG (High starting torque, low starting current)	—5 hp to 200 hp at 1800 rpm
TRI/CLAD Type KR (High starting torque, high slip)	—Available to 100 hp in speeds required for high-slip, flywheel drive (punch press, etc.)

Buy all the BONDS you can—*and keep all you buy*

GENERAL ELECTRIC

TRI/CLAD MOTORS

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ Production
- Adaptability
- Fixture Saving
- Operation Saving
- Material Saving
- ★ Fine Finish
- ★ Flatness
- ★ Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*

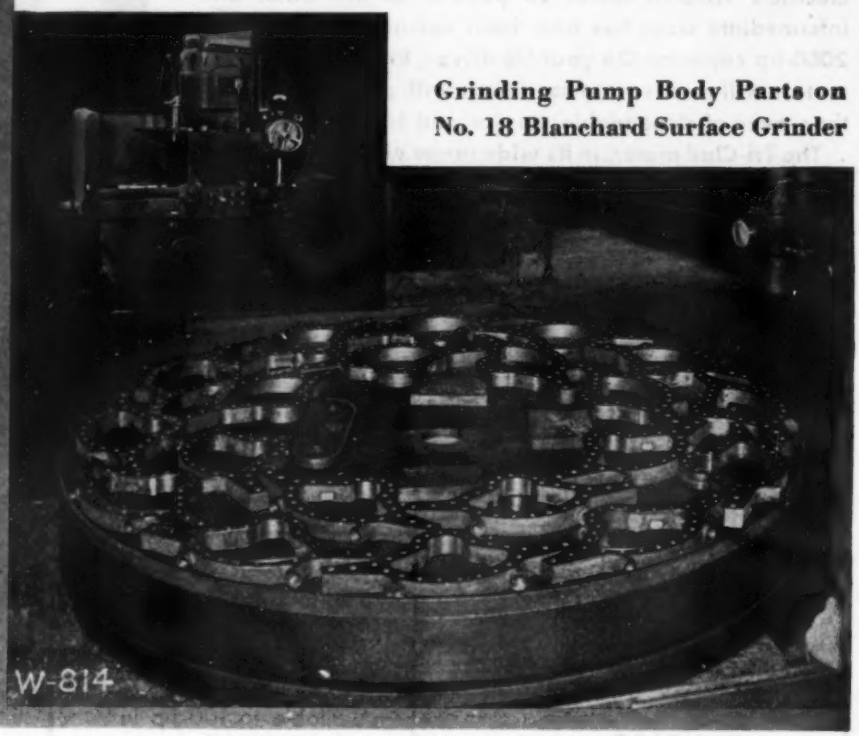
THIS is an excellent example of accurate surface grinding of pump body parts on a No. 18 Blanchard Surface Grinder.

These pump parts are held magnetically on a 36" chuck and work is held to very close limits giving a finish suitable for final lapping operation.

The material is high strength forged steel and .004" is removed from each side, to limits of .0003". Forty pieces 10⅝" long, 5⅛" wide and .756" thick (80 surfaces) are produced per hour.

The BLANCHARD MACHINE COMPANY

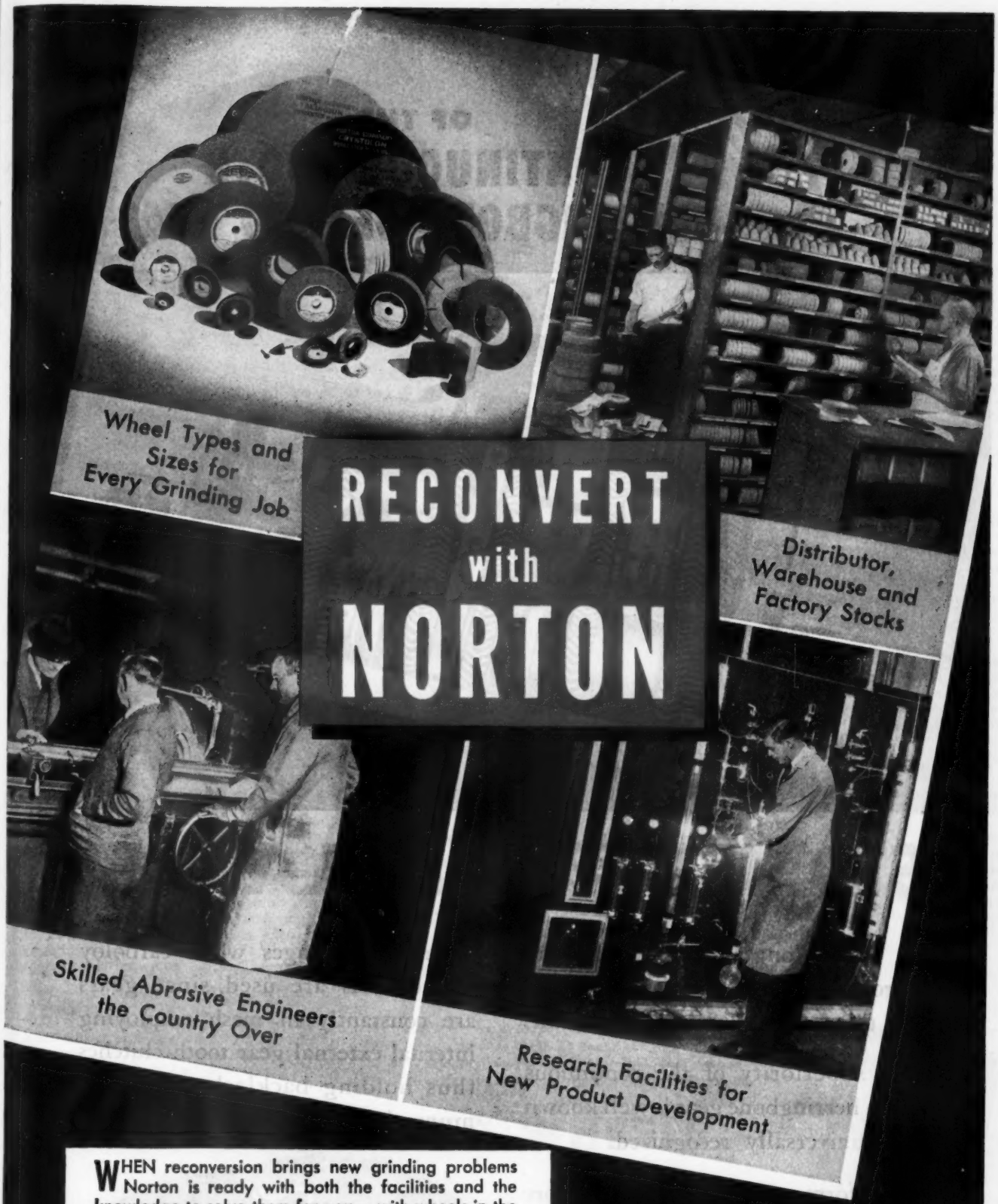
64 STATE STREET, CAMBRIDGE, MASS.



Grinding Pump Body Parts on No. 18 Blanchard Surface Grinder

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.


Wheel Types and Sizes for Every Grinding Job
RECONVERT with NORTON
Distributor, Warehouse and Factory Stocks
Skilled Abrasive Engineers the Country Over
Research Facilities for New Product Development

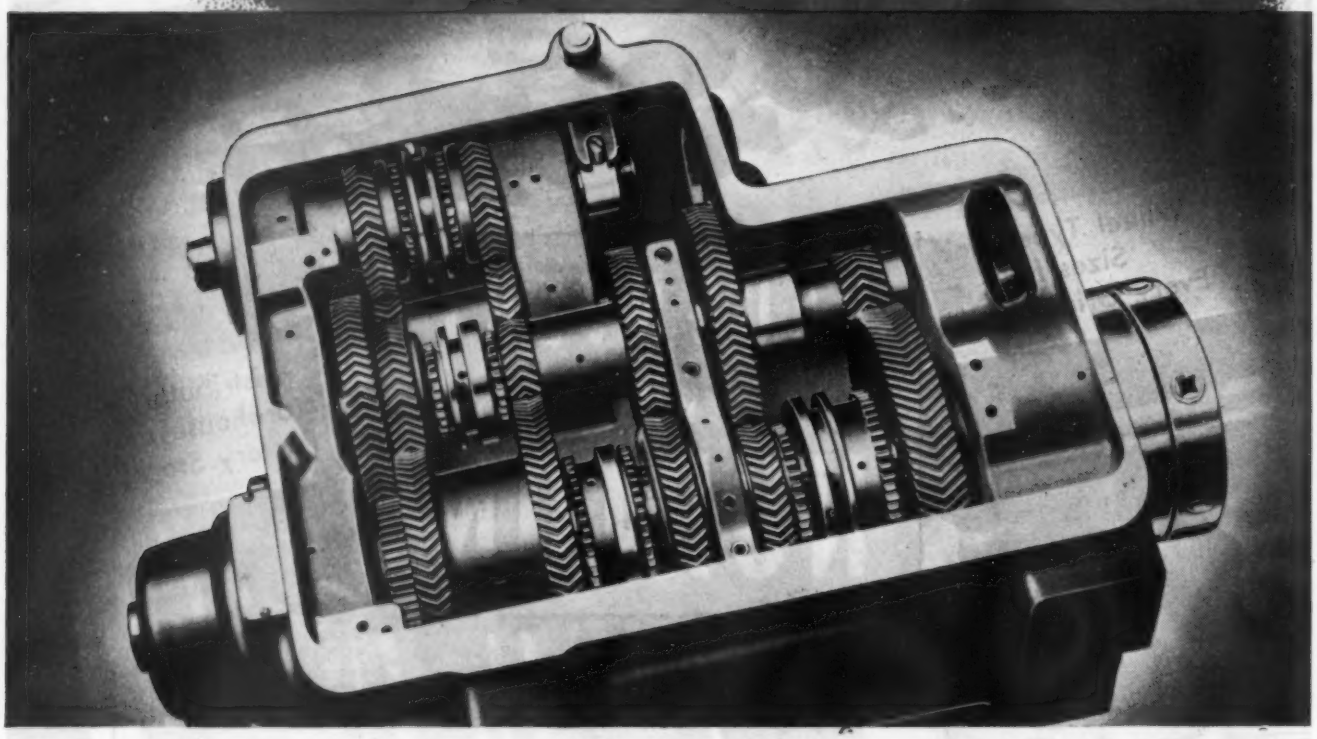
WHEN reconversion brings new grinding problems Norton is ready with both the facilities and the knowledge to solve them for you — with wheels in the sizes and shapes, abrasives and bonds for every grinding job — with distributor stocks in 184 cities and warehouse stocks in five industrial centers — with skilled abrasive engineers to give you real engineering help — with extensive research laboratories to develop new wheels for new grinding problems.

NORTON COMPANY, WORCESTER 6, MASS.

Behr-Manning, Troy, N. Y. is a Norton Division

NORTON ABRASIVES

Pioneers OF THE CONTINUOUS TOOTH HERRINGBONE GEARED HEAD



SIDNEY *Precision* LATHES

● Sidney long ago experienced the "growing pains" essential to perfecting this smooth flowing power unit.

The superiority of the continuous tooth herringbone gear is well known and universally recognized.

This form of tooth provides more tooth contact—results in greater strength, smoother action and eliminates end thrusts through the opposed helix angle.

This herringbone geared head offers distinct advantages when carboloy tipped tools are used, since gears are constantly in mesh employing internal external gear tooth clutches thus holding backlash to a minimum—insuring greater tool life.

The SIDNEY MACHINE TOOL COMPANY
Builders of Precision Machinery
SIDNEY • OHIO

Continued

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

This series of questions and answers is presented as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All questions will be answered by mail or in this column. No identities will be revealed if published.

44 Q. *"Awhile back you answered a question in regard to the type and shape of diamonds used in dressing and truing tools, but you didn't explain why certain kinds of wheels require certain kinds of stones. Will you please give the reason?"*

A. Because grinding wheels vary so greatly in type of grain, size of grain, grade, structure, shape and use, care should be exercised that a diamond is selected which is best suited in type, size and shape for the job in hand. Otherwise, the diamond may break, it may wear too fast, or it may leave "diamond marks" on the wheel.

45 Q. *"Why is it that grinding wheels which are rather open in structure are harder to balance than dense wheels?"*

A. The bottom of a wheel, and especially a wheel that is porous or of open structure, tends to absorb some of the coolant or grinding fluid, which may make it seem out-of-balance when it really isn't. To avoid this seeming out-of-balance, first true the wheel—then before balancing it, let it run free of any contact with the grinding fluid until all of the absorbed moisture is thrown off.

46 Q. *"What are the advantages and disadvantages of using straight mineral oil as a grinding fluid in grinding threads and gear teeth?"*

A. The advantages of using straight mineral oil as the grinding fluid in grinding threads and gear teeth are: (1) The required amount of stock can be removed with wheels of finer grain or grit than would otherwise be used, while at the same time obtaining a finer finish; (2) wheel face loads less, thus requiring fewer dressings and giving longer wheel life; (3) permits lighter dressings; (4) gives work a better lustre because of the smooth cutting action; (5) saves power due to a reduction in friction between the wheel and work.

Disadvantages: (1) Does not remove heat as fast as water or emulsions and thus is not suited for heavy grinding; (2) has a lower viscosity and therefore tends to become contaminated, which results in chips settling out more slowly; (3) some grinding operators object to it because of its fumes and tendency to spray.

In many plants, most of these disadvantages have been largely overcome or completely eliminated through efficient planning to that end.

47 Q. *"We have an infeed centerless job and the work finishes with a very slight taper from the front to the rear end. So far we haven't been able to correct this."*

A. We suggest that you first check the work support blade. If it is bent see that it is straightened or change to a blade that is straight. Second, check to see whether the blade is set at an angle to the wheel spindles. If so, correct this. Third, check the angle of the regulating wheel. If, as in your case, the front end is larger than the rear, increase the angle very slightly by means of the set screw provided for this purpose.

48 Q. *"We are about to do a sizable surfacing job on soft grey iron castings 6" long by 3" wide. Being tool men, we do very little grey iron grinding. Will you please recommend a wheel for this job that will remove the metal quickly and give a good commercial finish."*

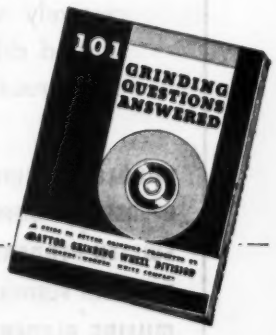
A. For the job you describe, we recommend our C 36-J-13-V-14 (old marking 936 J-3-V). This wheel has proved to be a fast metal remover while giving a very good commercial finish on a number of jobs similar to yours.

49 Q. *"Is there any rule for determining the amount of feeding in movement?"*

A. The amount of feeding in movement is chiefly determined by the nature of the work, the wheel to be used and the work speed. In view of these variable factors, each job must be studied by itself—keeping in mind production, finish and accuracy.

READY NOW...a guide to better grinding!

101 "Answers" to everyday grinding problems—indexed for quick, easy reference—will be sent FREE to anyone interested in better grinding practices. Just fill in and mail coupon below.
SIMONDS WORDEN WHITE CO., DAYTON 7, OHIO.



DAYTON GRINDING WHEELS

SIMONDS WORDEN WHITE CO.,
712 Negley Place, Dayton 7, Ohio

Please send me Free Booklet "101 Grinding Questions Answered"

Name_____

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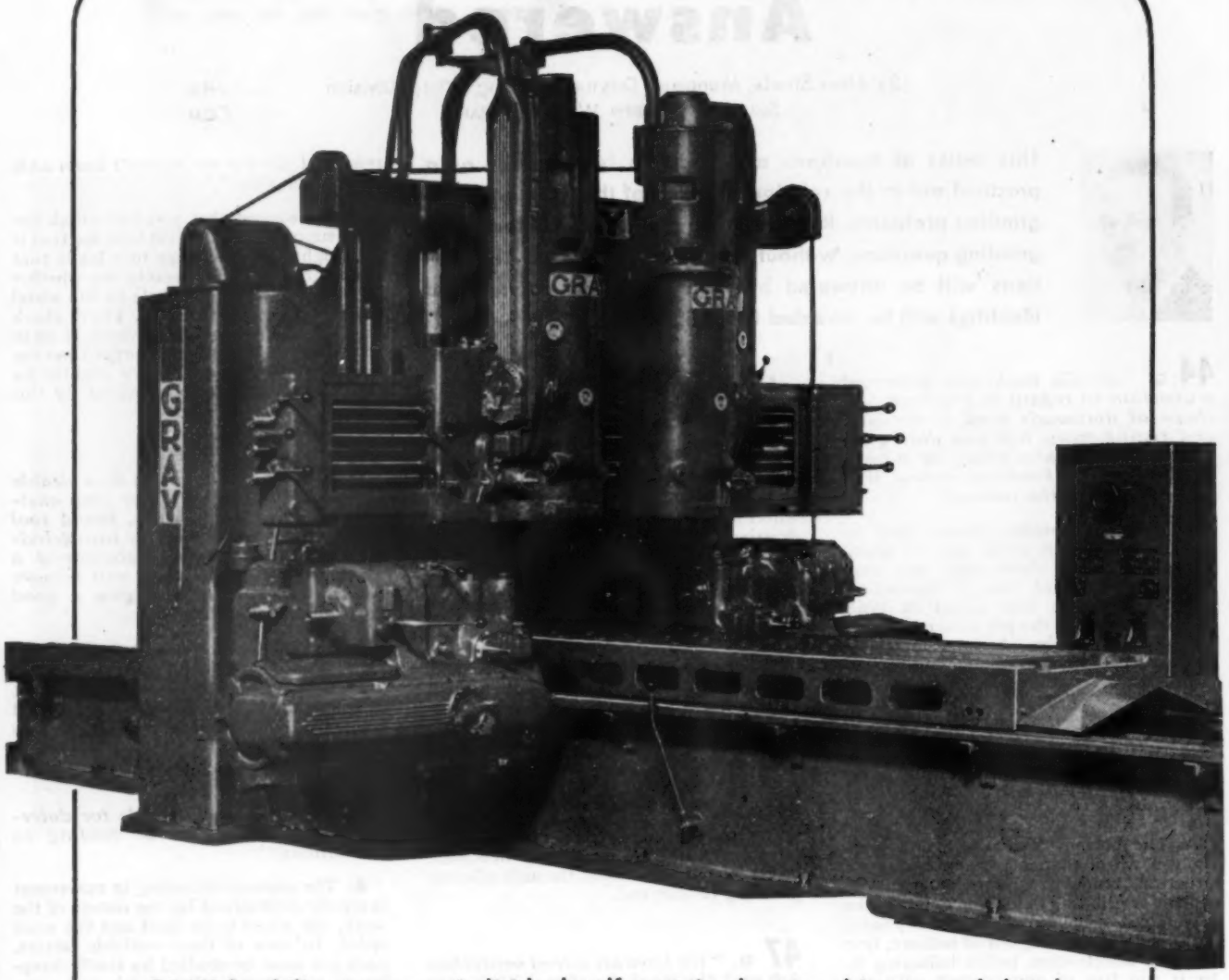
GRAY means Flexibility



GRAY flexibility means an individual, self contained motor drive to each head. This permits running two or more heads at different speeds—a great advantage when your work requires different sized cutters, as all heads may be worked successively without changing speeds. This construction provides a much more rugged drive for swiveling heads and eliminates use of exposed, fast running, dangerous spline shafts.

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
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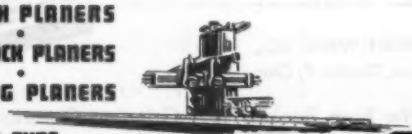
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES

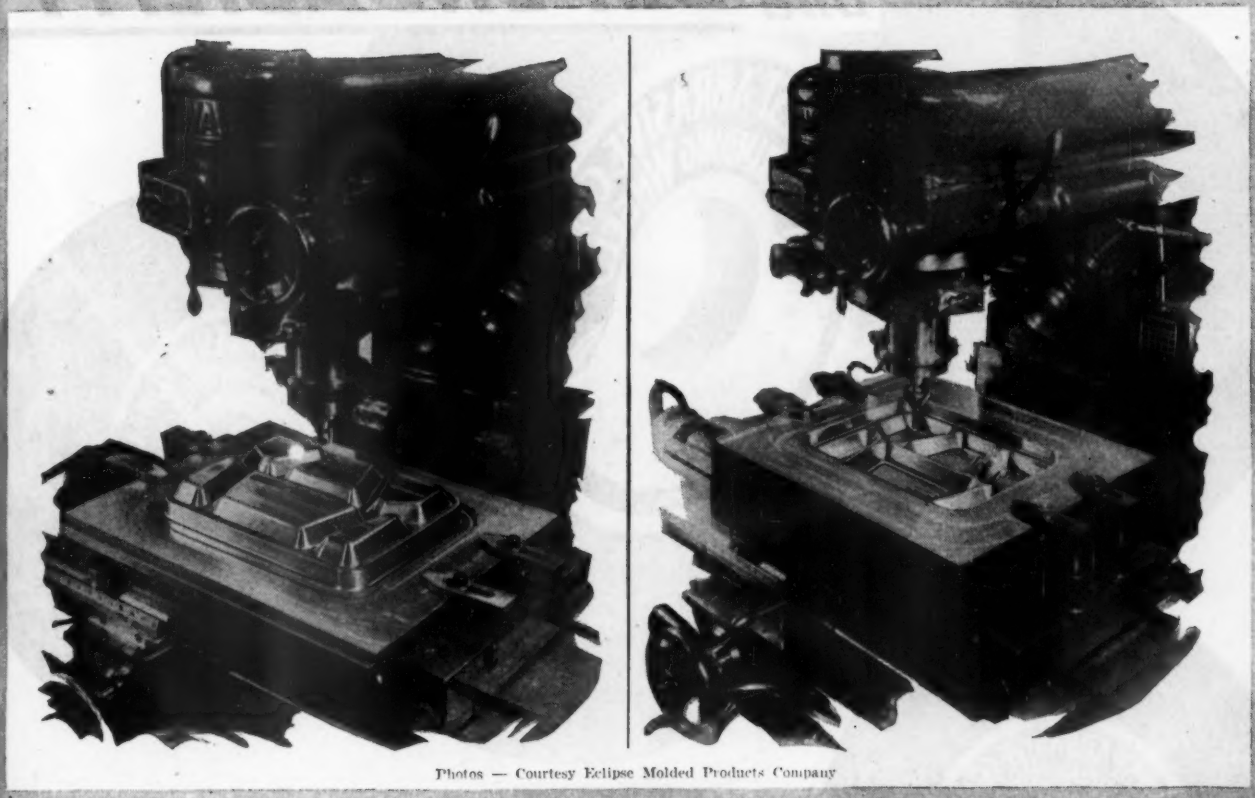
WRITE FOR COMPLETE INFORMATION TO OUR ENGINEERING DEPARTMENT



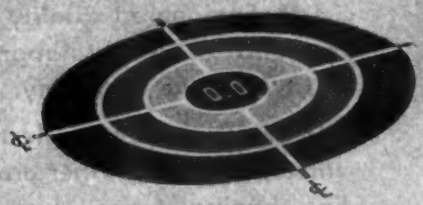
The G.A. GRAY Co.

CINCINNATI 7, OHIO, U. S. A.

How would you handle this Job in your Shop?



Photos — Courtesy Eclipse Molded Products Company



1001-PC

Molds for plastics pose some tough milling problems occasionally. Here's a tray mold — that could have been difficult, but it was completed on a Milwaukee Rotary Head Milling Machine with typical speed, economy, and accuracy.

Read this job report —

TRAY MOLD

CAVITY SIZE — width, 12 inches, length, 15½ inches, depth, 1½ inches.

Time required for milling both mold halves complete — 219 hours.

All form cutters milled to correct size and shape on the Milwaukee Rotary Head Milling Machine.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements—possible only with this machine—transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C and complete information.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE.

Kearney & Trecker

Products

CORPORATION

Milwaukee 14, Wisconsin

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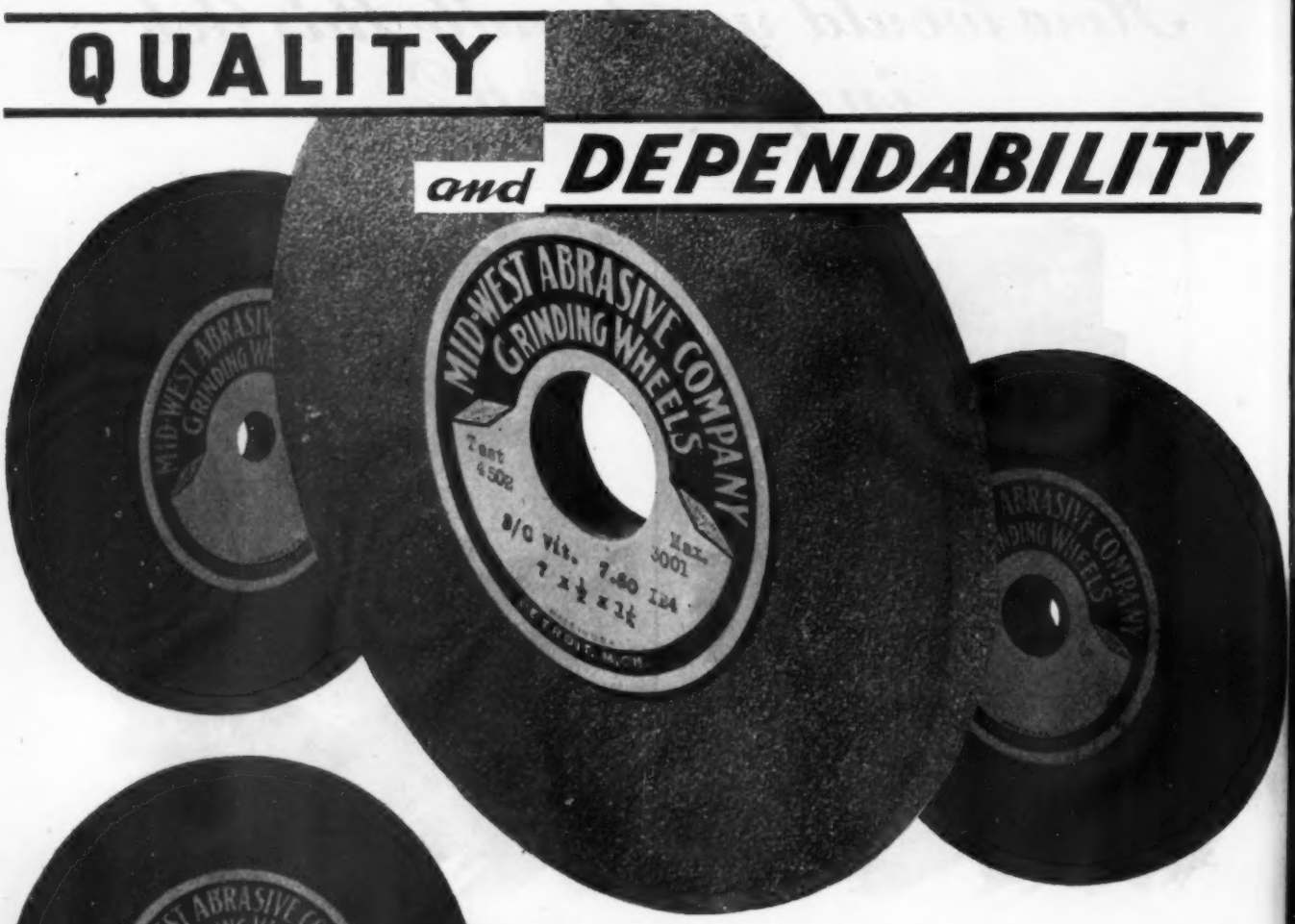
QUALITY and DEPENDABILITY



● **Engineered quality and dependability of performance are the hallmarks of products of the Mid-West Abrasive Company.**

Mid-West's outstandingly successful tool room grinding wheel, and every other product of the broad Mid-West line—honing stones, sharpening stones, coated abrasives, disks and wheel dressers—all must bear these two hallmarks.

Let quality and dependability guide you in your choice of abrasives, and we feel certain that choice will be Mid-West. Prompt delivery on all items.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives · Owosso, Mich. · Detroit · Rochester, Pa.

STANDARD

Announcing DuBo

The Better PLUG GAGE

FIXED LIMIT TYPE

Color Signals

GREEN = GO

RED = NOT GO

PATENTS PENDING

Newest Development in Simple, Precise, Effortless BORE GAGING

● Again STANDARD pioneers in producing DuBo, newest, most completely satisfactory bore checking gage of the fixed limit type yet produced. DuBo brings to bore gaging new, effortless, finger-tip control, assured precision and speed far beyond the scope of ordinary plug gages . . . whether used by skilled or unskilled workers. Vivid color bands unmistakably identify "go" and "not go" members; unusual lightness and balance minimize fatigue and fatigue-errors; simple manipulation makes DuBo ideal for use at bench or machine.

Simple, yet Precise... Light, yet Sturdy

EASY TO USE... TELLS MORE

Spherical shape, ingenious chamfering and relief, make entrance easy, gaging positive.

★

May be entered into bores actually smaller than gage diameter without forcing or marring work piece.

★

"Go" and "not go" color signals prevent confusion, fumbling, wasted motions, faulty readings.

★

Chamfer edge helps clean bore and prepares clean surface for accurate gaging.

★

Finger-tip "feel" and control reveal true internal conditions at any point in bore.

★

Reveals out - of - roundness, taper, belling and dimensional deviations by unmistakable tilt of handle.

★

May be used in deep bores and close to bottom of blind bores.

Write! Send NOW for illustrated DuBo bulletin . . . tells all about this remarkable new gage.

STANDARD GAGE CO., Inc.

Poughkeepsie, N.Y.

NOW IT CAN BE TOLD

Accuracy in "Millionths" on Production Job Obtained on Bryant No. 112 Internal Grinders

B-29 FUEL INJECTION PUMP PRODUCED BY ECLIPSE

SPRINGFIELD, VERMONT — Another stride by American war production genius was disclosed recently by the Army Air Forces Air Technical Service Command and Eclipse Machine Division of Bendix Aviation Corporation.

Mass production of fuel injection pumps for the B-29 Superfortress has been achieved at the Eclipse plants in Elmira, New York. The Bryant No. 112 Internal Grinder was chosen for the sleeve bushing job, and technical details for production of this part were worked out through the close cooperation of Eclipse and Bryant engineers.

Production Tolerances Unbelievable

In the hands of Eclipse workers, the Bryant machines are producing parts to diameter *tolerances of 10 millionths of an inch or less.* This necessitates maintenance of straightness and roundness to even finer tolerances. This infinitesimal degree of precision was graphically demonstrated by Mr. T. W. Tinkham, General Manager of the Eclipse Machine Division. After demonstrating the precise fit between the plunger and the bushing ground on the Bryant machine, Mr. Tinkham had a newsman rub his fingers on the pump piston. The very slight film left by the newsman's fingers was sufficient to make the plunger stick in the bushing.

Improves Bomber Performance

B-29's equipped with the fuel injection pump are flying surer than ever before at extreme altitudes where rarefied atmosphere, varying pressures and sub - zero temperatures must be taken into account. It is interesting to note that the gasoline is the only lubricant used in the pump assembly.

Cooperation Plus Secrecy

This is a typical example of the way Bryant men have cooperated with the engineers of our leading manufacturers during the war years. This is one example, but hundreds of others still must remain on the secret list. Now, when you are planning for a peacetime production there still is a Bryant man ready to assist you.

(*Photo Courtesy Eclipse Machine Division*)

MACHINES THAT DO THE JOB. This is part of the group of over a hundred Bryant internal grinders at Eclipse Machine Division, Bendix Aviation Corporation, Elmira, New York. These machines are grinding sleeve bushings to a tolerance of 10 millionths or less.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

Fosdick HIGH SPEED DRILLS

meet rigid precision and production demands on holes up to 1½"

● The equipment used in tool and die shops must not only be flexible to handle a wide range of work but must be capable of meeting precision requirements common to this class of work.

The Fosdick High Speed Sensitive Drills shown are typical of the type of Fosdick equipment being used in hundreds of tool and die shops where accuracy and costs are important factors.

The wide range of speeds available—the ease with which they can be changed—the simplicity of operation makes these sturdy drills popular for drilling holes up to 1½ inch diameter.

Furnished in any number of spindles up to six—available with tapping spindles. *For complete information write for Fosdick High Speed Drill Bulletin H. S. A.*

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

(Above)
Enclosure at rear of Norton 4-in. Type C grinder houses compact Thy-mo-trol electronic panel and other electric control.

(Left)
Ease and accuracy of control have made this grinder popular for production work on small parts.

PUTS 10 TO 1 SPEED RANGE AT HER FINGERTIPS

AN advanced type of precision grinder, built by the Norton Company, Worcester, Mass., has won wide favor for its high production rates on small machine parts. Its outstanding characteristic is simple, yet highly flexible, control, right at the operator's fingertips.

Work speeds on this grinder are set on a dial—any level from 100 to 1000 rpm, with constant torque throughout—thanks to the use of a G-E *Thy-mo-trol drive*. Jogging control is also easily adjustable over a wide range, and dynamic braking gives fast stops. Yet the machine operates on a regular a-c power supply.

FOR WIDE-RANGE STEPLESS SPEEDS

A Thy-mo-trol drive is a complete, co-ordinated set of equipment including an electronic panel, transformer, control station, and a d-c motor matched to the job. It's the increasingly popular choice of machine builders *and users* for applications requiring stepless speed control, adjustable accelerating torque, or constant speed under changing loads.

Standard Thy-mo-trol drives can be obtained in ratings from 1/8 to 25 hp. In special cases, speed ranges as high as 100 to 1 have been furnished. The experience of G-E engineers is available to help make Thy-mo-trol an integral part of your product or processing set-up. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

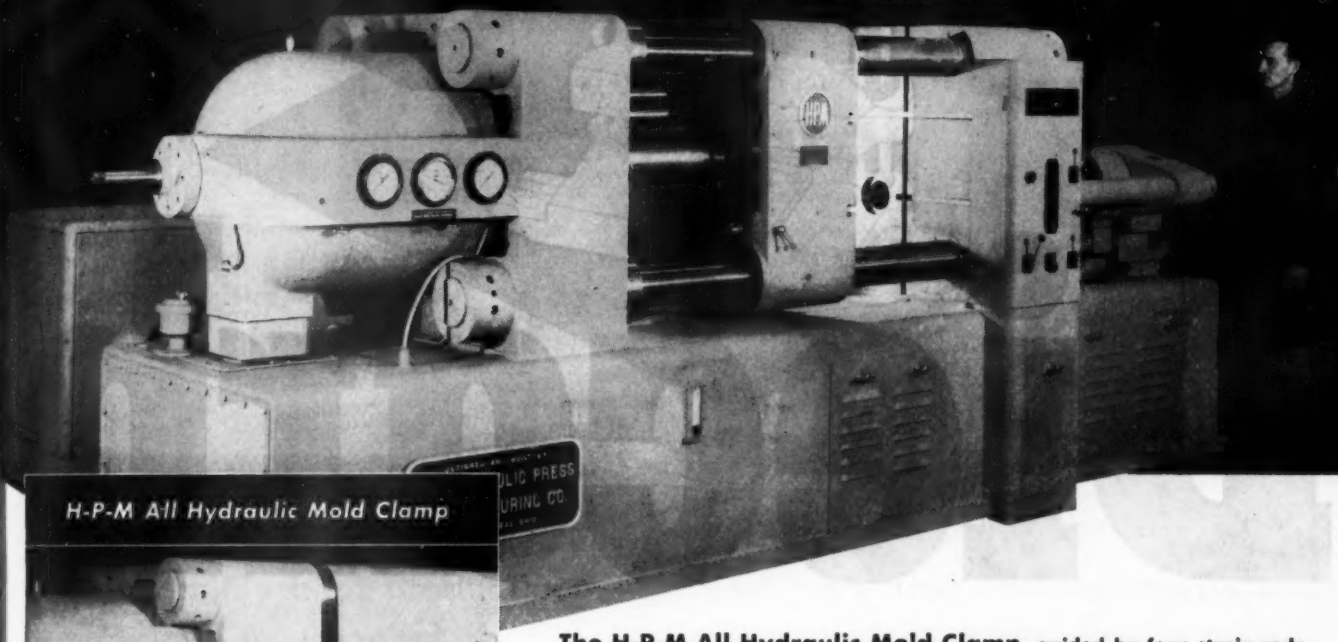
GENERAL ELECTRIC

670-190-8906

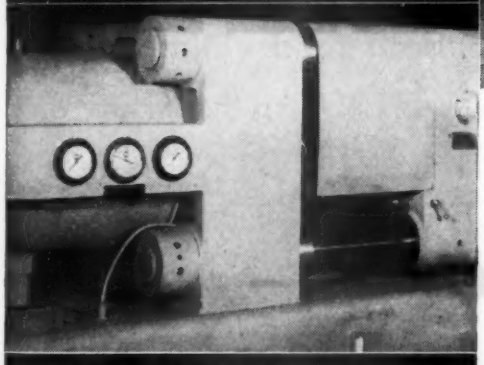
Buy all the BONDS you can—*and keep all you buy*

THY-MO-TROL DRIVE

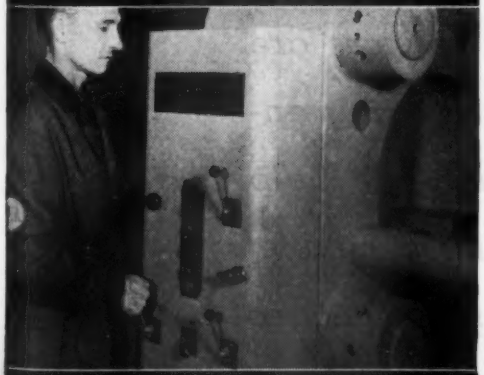
CHECK ✓ THE DESIGN FEATURES OF THIS NEW *All-Hydraulic* MACHINE FOR *High Pressure Die Casting*



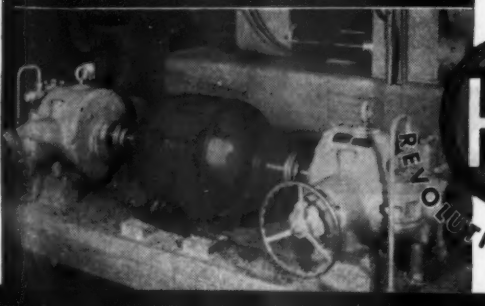
H-P-M All Hydraulic Mold Clamp



H-P-M Automatic Cycle Control



H-P-M Hydro-Power Operating System



The H-P-M All-Hydraulic Mold Clamp, guided by four strain rods, assures positive mold alignment. Die change-over is simple and fast. Both clamp stroke and pressure are adjustable. Positive overload protection is provided at all times. High speed closing and opening, with automatic slow-down prior to mold contact guarantees fast, shockless operation.

H-P-M Automatic Cycle Control permits maximum production. Manual effort has been minimized. Electric hand switches control mold clamp, hydraulic ejector and core pulls. A single Multiflex timer controls the automatic cycle after metal has been ladled into "cold" chamber. A selector switch is provided for manual operation of the entire cycle, if desired.

The H-P-M HYDRO-POWER Operating System provides a direct and compact source of hydraulic power. No accumulator is required. Pumps valves and controls are all built by H-P-M for heavy duty oil-hydraulic service. Undivided responsibility to the user is guaranteed. Each pump is equipped with convenient volume and pressure controls. Only electric power and cooling water are required for operating this self contained machine.

Write today for your free copy of H-P-M Bulletin 4402 describing these revolutionary H-P-M All-Hydraulic high pressure die casting machines.

THE HYDRAULIC PRESS MFG. COMPANY

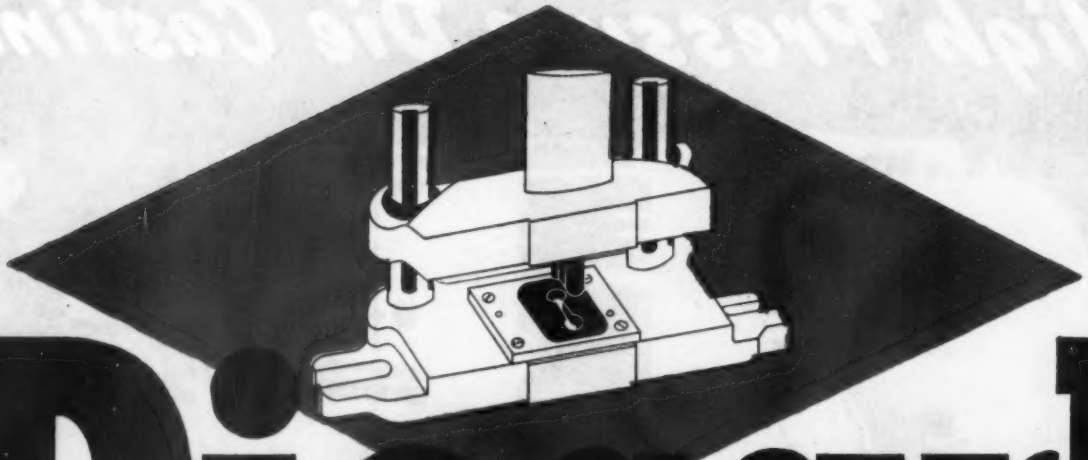
Mount Gilead, Ohio, U. S. A.

Branch Offices in New York, Philadelphia, Cleveland, Detroit and Chicago. Representatives in principal cities.

HPM *All-Hydraulic... High Pressure* **DIE-CASTING MACHINES**

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

HERE IT IS —



Diecarb

Get in touch with us—

Complete Diecarb Engineering Services are ready for you—die designers, brazing engineers, practical grinding men—to help you and to teach your operating personnel the fine points and short cuts of Diecarb die-making and operating.

NEW YORK · HARTFORD · PHILADELPHIA · PITTSBURGH

Firth-Sterling's

ORIGINAL DEVELOPMENT

of Sintered Carbide for

BLANKING and FORMING DIES

DIECARB perfected over several years of research, trials and practical tests, is now offered to the trade for blanking die applications—a "natural" for extremely high production work, and providing extraordinarily long life between grinds.

DIECARB grades are available for blanking up to 7/16" in thickness for a variety of materials including metals, plastics, paper, etc. Performance runs have produced 10 to 1000 times the number of pieces per grind compared with former dies... downtime of six to eight weeks per year has been saved... operating costs have been lowered substantially.

If you have a blanking application now, or are planning postwar products where blanking and forming are important operations—investigate the possibilities of Diecarb.

Firth-Sterling
STEEL COMPANY
Offices: **McKEESPORT, PA.**

Diecarb

CLEVELAND · DAYTON · DETROIT · CHICAGO · LOS ANGELES

Snyder Special

HANDLES PARTS of VARIOUS SIZES

This Snyder special-purpose machine is designed to mill lubricating slots in large tapered valve bodies. It is fully adjustable as to the size and position of cuts and will handle parts from ¾″ diameter by 4″ length, up to 6″ diameter by 24″ length. In the job illustrated, four slots are cut, two long and two short.

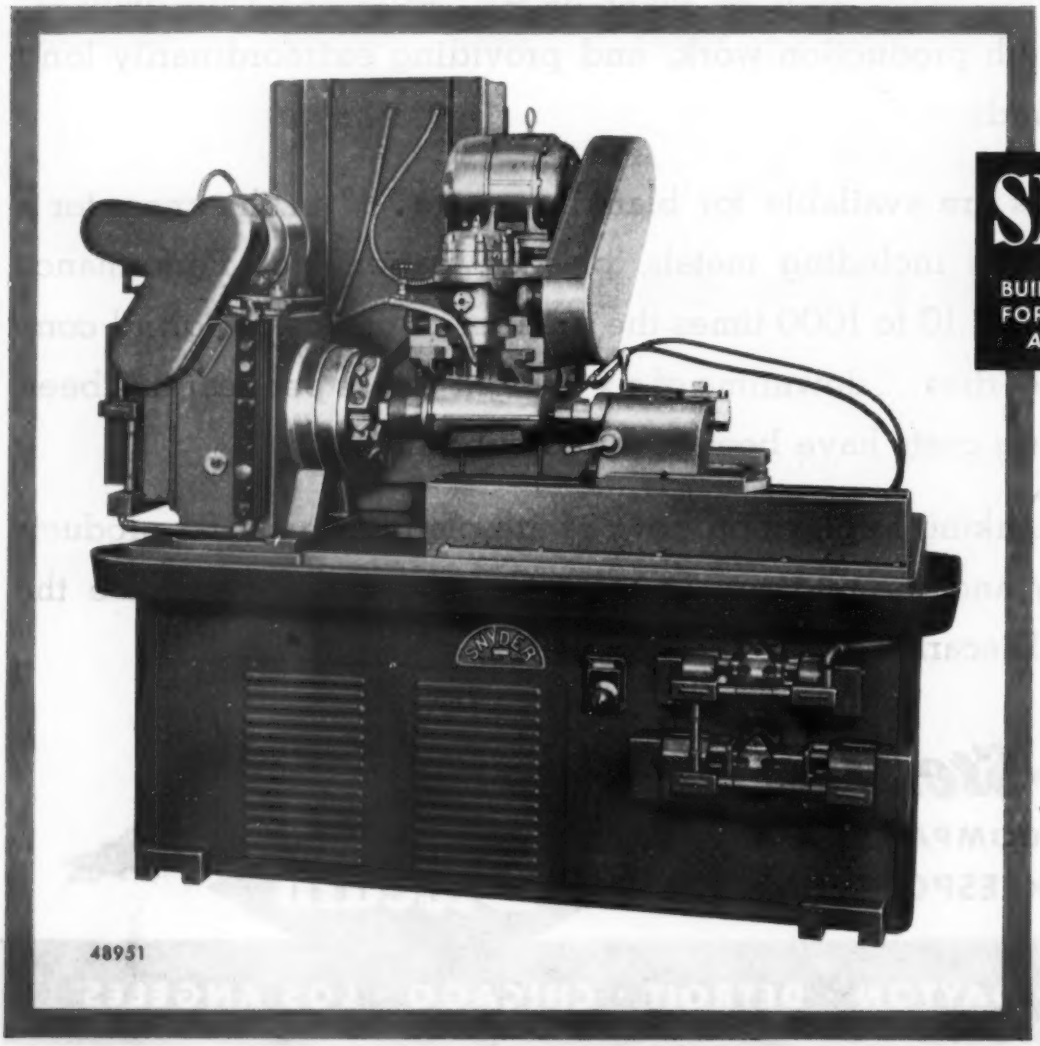
The part is positioned radially from the square end of the valve plug and stem and is held between centers. Indexing is by means of a motor-driven Geneva mechanism which includes a positioning pin and a master control drum governing the travel of the milling cutter head. This mechanism also selects automatically the length of each successive cut.

The spindle housing is installed on a cross slide, adjustable for depth of cut and respective diameter of work and for length of longitudinal feed stroke.

From starting position near the center of the slide the cutter head travels to the beginning of its cut, moves into the work, feeds for the full length of the cut, retracts and returns to center position.

The machine then indexes 90° and automatically selects the next required length of cut and so repeats the cutting cycle until all slots are completed. Hydraulic equipment is in the welded steel base. Coolant tank is separate from the machine.

The important benefits of this machine are: variety in size of parts that can be handled, operation by unskilled help, minimum operator fatigue and production increased many times over previous set-ups. Perhaps there are spots in your production line where Snyder "specials" can accomplish similar improvements. We invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette Avenue, Detroit 7, Michigan.*

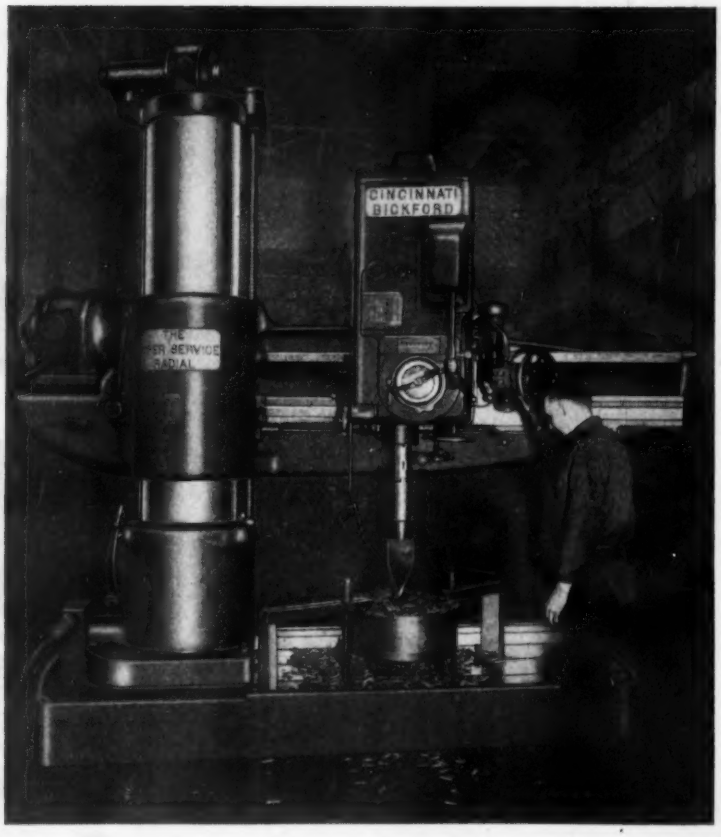


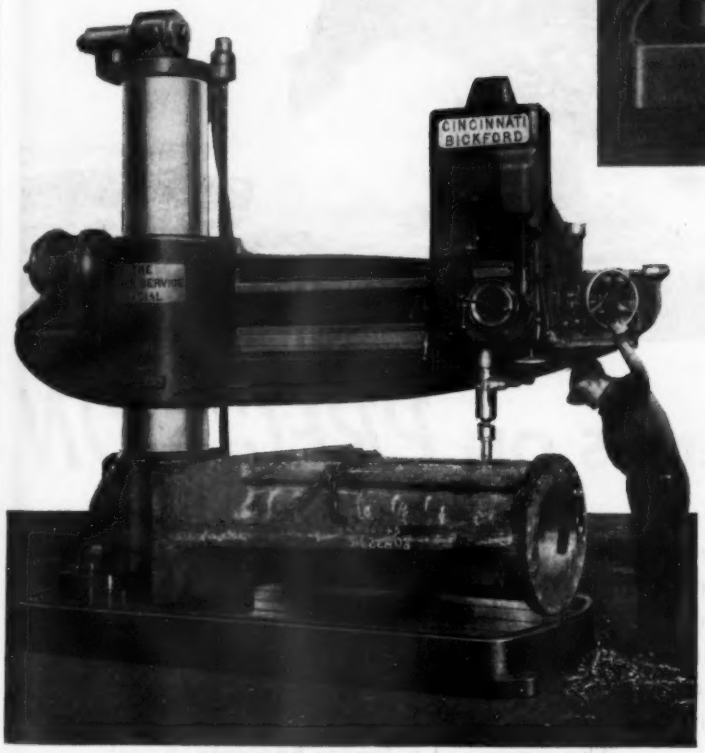
SNYDER

DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries.

Whipping TOUGH JOBS





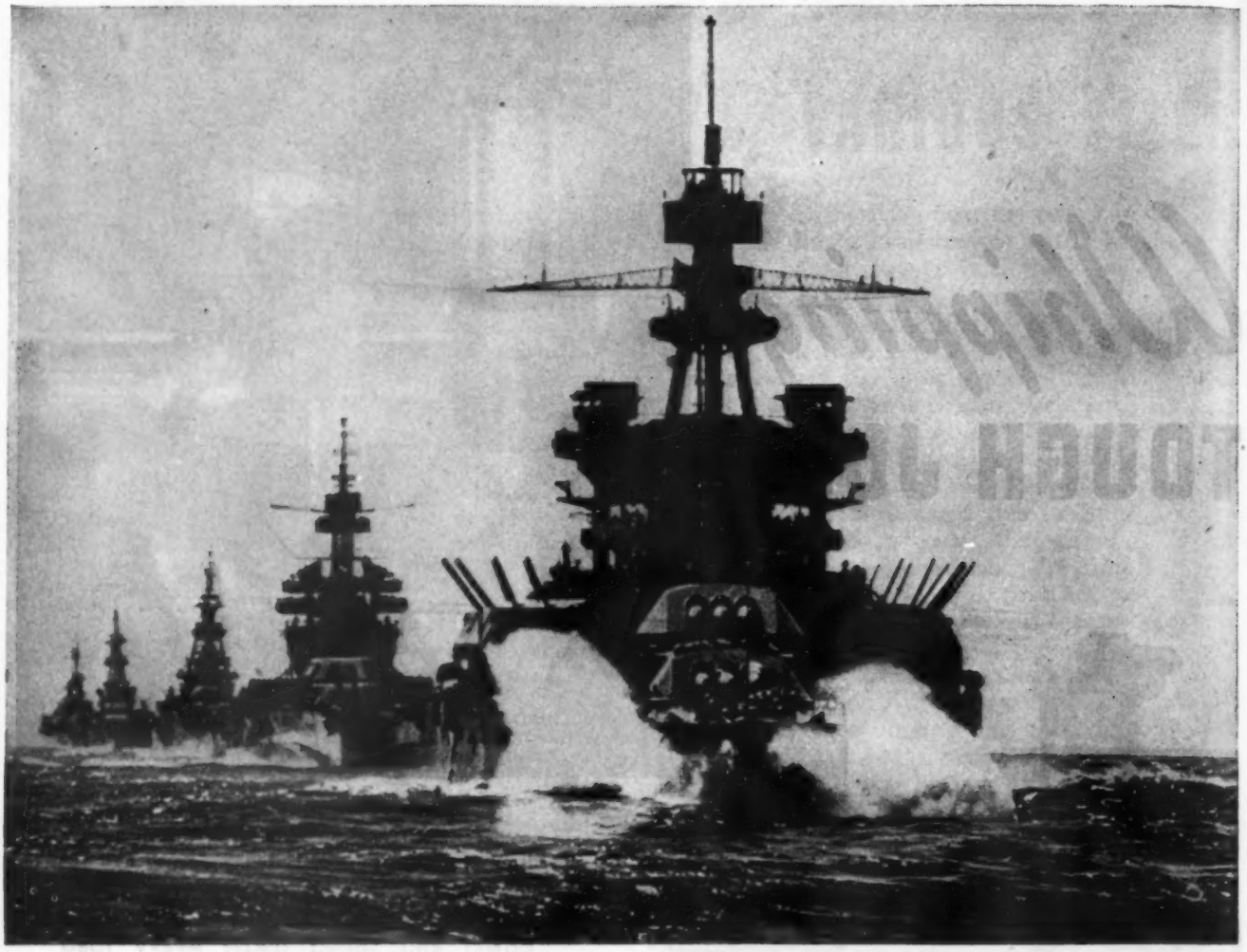
The outstanding ability to maintain power and speed under heavy load whips the tough job. Cincinnati Super Service Radials in the Erie Foundry Company, Erie, Pa., are meeting the requirements on tough jobs, requiring power and stamina. Their accessible and fully centralized controls have contributed to rapid and accurate production . . . along with other Cincinnati Bickford features of design.
Write for Bulletin R-24A.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

See our condensed Catalog in Sweet's File

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**



THEIR *POWER* DEPENDS ON *PRECISION*

THE POWER of America's mighty battleships may truly be said to depend on machining skill and precision. From stem to stern — from the giant 16-inch guns with their intricate firing mechanisms above deck to the turbines and propellers below — modern men o' war contain thousands of parts finished to the most precise tolerances.

Mass production of precision parts — whether for a battleship or a jeep, a plane or a tank — calls for faster machining, better finish and longer tool life. Plant operators everywhere assure this by using Texaco Cutting and Soluble Oils.

Texaco cutting fluids cool and lubricate the tools, carry away heat, prevent chip welding—thus prolonging tool life, assuring greater output.

The services of a Texaco Engineer specializing in cutting coolants are available through more than 2300 Texaco distributing plants in the 48 States. Get in touch with the nearest one, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT—CBS

Three Ways to Cut Costs

NEVER BEFORE has the necessity for cutting production costs been so urgent.

In the war the major consideration was speed of production, but in peacetime it will be cost of production.

The problem of cutting costs is made more acute and urgent by the announced policy of the government of allowing substantial wage increases while holding prices down.

We have the word of William H. Davis, director of economic stabilization, that the new wage-price regulations are based on the conviction that better wages do not result in direct price advances because higher labor costs can be absorbed by other production factors.

Whether or not one quarrels with Mr. Davis as to his conclusions, the fact is clear that profits hereafter will depend more than ever upon reductions in production costs.

There must be a reversal from now on of the thinking that has prevailed during the war that it was more essential to produce the right goods in the desired volume at the right time than to worry about costs.

With the return to civilian goods manufacture, industry will be compelled to examine costs microscopically rather than regard them as a secondary consideration.

The main objective will be to produce and sell the largest possible volume of goods at the lowest possible prices. That in turn means that the lowest possible costs must be attained.

If labor costs are to rise, with the government's blessing, the reduction in costs must be secured in other ways if profits are not to be sliced to meager and unsatisfactory proportions.

Several ways are open to the accomplishment of this objective, among them:

1. Replacement of old, obsolete plant equipment with modern, cost-saving machinery. An advance in wage rates can be justified only by increased output per man. Only when machines of the latest design are used can peak production per man be achieved. America's metalworking shops are full of old, high-cost machines that should be replaced if management has an eye on future profits.

2. Establishment of incentive systems that reward the worker in ratio to the amount of work performed. Even Soviet Russia has recognized the soundness of such a policy and has adopted it with far-reaching results. Its use should be extended in this country.

3. Harmonious relationship between management and employees. That in itself will go a long way toward getting men to work hard and enthusiastically. Labor strife can quickly convert the best efficiency record into a poor one. Responsibility for a satisfactory relationship rests just as much upon labor as upon management.

The wise and alert manufacturer will look carefully into all of these ways of improving the efficiency in his shop, for higher output and lower production costs will spell larger profits in the months ahead. What is more important, it will result in greater employment which all of us are striving for.

Burnham Finney

A DOUBLE DECKER DOES THE WHOLE JOB...

Two completely different bends on one press brake, with one set-up and one handling, are being made on this Cincinnati Press Brake and Double Decker Die. No time is lost in changing dies or shifting work to a second machine.

This combination of smooth machine operation and correctly engineered dies is streamlining the job.

Write for Catalog B-2.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

BASIC RELATIONSHIPS OF Bevel Gears

BY ERNEST WILDHABER, GLEASON WORKS

Fig. 1—Straight bevel gears, above, have teeth converging to the cone center

Fig. 2—Spiral bevel gears have teeth curved lengthwise and inclined to the elements of the conical pitch surfaces

IN ANALYZING bevel gears it is helpful first to compare their characteristics with spur gears, discussed in an earlier number, and with hypoid gears, which will be covered in later numbers. Bevel gears, which are tapered gears whose axes are set at an angle and intersect, and whose teeth may be either straight or curved, are shown in Figs. 1 and 2. Hypoid gears are tapered gears with offset axes disposed at an angle and represent the broadest form of gearing, inasmuch as no mathematical restriction is set to the offset of the axes or the shaft angle.

Bevel gear pairs and spur gear pairs have the axes of both gears disposed in a plane and therefore fulfill a condition not imposed on hypoid gears. Bevel gears are not restricted as to shaft angle, whereas spur gears, whose axes are parallel, have a shaft angle of zero.

General laws applying to hypoid gears apply to all other forms of gears. Spur gear laws do not of necessity apply to anything but spur gears. Laws governing bevel gears also apply to spur gears but not necessarily to hypoid gears.

The axes OC' and OC'', of a bevel gear pair, Fig. 3, intersect at cone center O and constitute the axial plane of the gear pair. In this axial plane all points of the gears, located in their zone of engagement, move in the same direction when the gears are rotated on their axes. At some points of the axial plane the two gears not only move in the same direction, but at the same velocity.

Point P is a point of equal velocity of the two gears, when its distances from the gear axes OC', OC'' are proportionate to the numbers of teeth N', N'' of the two gears. Each point of line OP also has distances from the two axes in the same proportion, and line OP of the axial plane is therefore the line where, at any one of its points, the two gears have the same velocity. The two gears have no relative linear velocity at any point of line OP. Relative motion of the two gears can therefore only be a turning motion about line OP at any one instant.

When the gears rotate, line OP, the instantaneous axis of relative motion, describes a conical surface on each of the two gears. These surfaces are identical with surfaces described by rotating line OP about each of the gear axes and can be considered parts of the gears themselves. As the gears rotate they roll on each other without sliding.

They are the pitch cones of the gears, and angles $\gamma = POC'$ and $\Gamma = POC''$, are the pitch angles.

At any point P of the instantaneous axis, the distances from the axes of rotation are proportionate to the sines of the pitch angles, and this proportion should be equal to the proportion of the tooth numbers. Hence

$$(1)\quad \frac{\sin\gamma}{\sin\Gamma} = \frac{N'}{N''}$$

The two pitch angles γ and Γ add up to the shaft angle Σ of the bevel gear pair. Hence

$$\sin\Gamma = \sin(\Sigma - \gamma) = \sin\Sigma\cos\gamma - \cos\Sigma\sin\gamma \text{ and } \frac{\sin\Gamma}{\sin\gamma} = \frac{\sin\Sigma\cos\gamma - \cos\Sigma\sin\gamma}{\sin\gamma}$$

$$= \sin\Sigma\operatorname{ctn}\gamma - \cos\Sigma = \frac{N''}{N'}$$

$$(2)\quad \operatorname{ctn}\gamma = \operatorname{ctn}\Sigma + \frac{N''}{N'\sin\Sigma}\quad ;\ \Gamma = \Sigma - \gamma$$

This known formula applies to any shaft angle Σ. For right angle shafts, $\Sigma = 90$ deg., $\operatorname{ctn}\Sigma = 0$, $\sin\Sigma = 1$.

$$(2a)\quad \operatorname{ctn}\gamma = \frac{N''}{N'};\ \tan\gamma = \frac{N'}{N''};$$

$\Sigma = 90$ deg.; $\Gamma = 90$ deg. $-\Sigma$

The gear teeth intersect the conical pitch surfaces in tooth spirals T' and T'', Fig. 3, which may be either straight or curved, and will be referred to as pitch lines of the gears. The pitch lines of mating gears are related to each other as if they were printed from one pitch cone to the other—at least when the gears are fully conjugate and have no ease-off at the tooth ends. The length of arc between two pitch lines is the same on both pitch cones at any given distance from the cone center O.

Inasmuch as the relative motion of one gear on the other is, at any considered instant, a turning motion about an instantaneous axis OP, all points of said one gear move about said axis. Gear contact is possible only at points where a tooth tangent coincides with this direction of relative motion. This means that the tooth normal, at any point of contact between the gears, passes through the instantaneous axis because it is perpendicular to this tooth tangent.

Fig. 4 is a view along instantaneous axis OP, and a section along line $C'\ C''$ of Fig. 3. Here Q is a point of contact, and the common normal PQ to the contacting tooth surfaces passes through the instantaneous axis projected at P. Normal PQ is ordinarily inclined to the drawing plane of Fig. 4, for it is preferred to consider the surface normal at point Q rather than the profile normal in a section.

When the gears turn on fixed centers OC' and OC'', through infinitely small turning angles $d\theta'$ and $d\theta''$, these angles are in the inverse proportion of the tooth numbers, so that

$$d\theta'' = \frac{N'}{N''}\ d\theta' = \frac{\sin\gamma}{\sin\Gamma}\ d\theta' =$$

Relative motion is most apparent when one of the gears, such as the lower gear, is held stationary. If the initial turning motion $d\theta''$ about this gear axis were in counter-clockwise direction, then the second turning motion must be in the opposite direction to restore the original position of the lower gear.

This latter motion is carried out by the whole assembly and moves axis OC' about axis OC''. In this motion, point C' of axis OC' is displaced laterally and reaches a position C'_1, as in Fig. 4. The distance of point C'_1 from the axial plane is the product of the distance of point C' from axis OC'', multiplied by the sine of the turning angle $d\theta''$. The sine is equal to the angle $d\theta''$ itself in radian measure, at the infinitely small angles considered.

The distance of point O' from axis OC'' is

$OC'\sin(\gamma + \Gamma) = OC'\sin\Sigma = \frac{OP\sin\Sigma}{\cos\gamma}$, as in Fig. 3

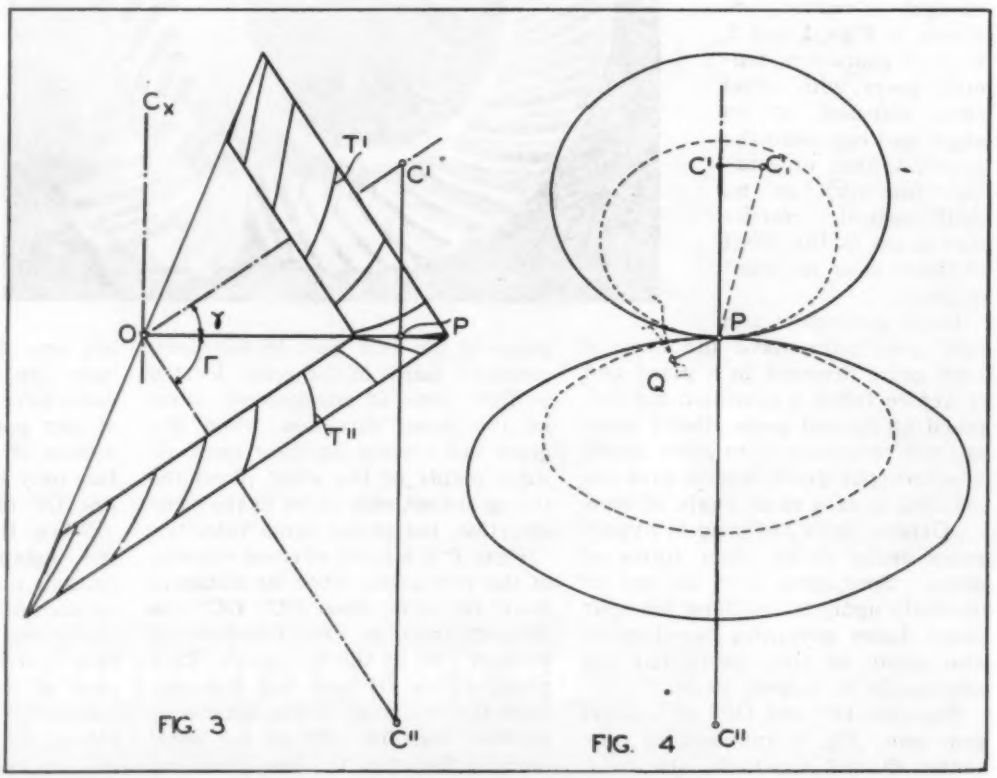


FIG. 3

FIG. 4

Fig. 3—Pitch lines of mating gears are as if printed from one conical pitch surface to the other

Fig. 4—Relative motion, at any instant, is equal to a turning motion about an instantaneous axis

Hence

$$C'\,C''_1 = OP\,\frac{\sin\Sigma}{\cos\gamma}\,d\theta''$$

The same position of the upper gear on the stationary lower gear can also be obtained by an infinitesimal turning motion $d\theta_1$ about the instantaneous axis OP, which appears at P in Fig. 4.

$C'\,C''_1 = PC'\,d\theta_1 = OP\,\tan\gamma\,.d\theta_1$

$C'\,C''_1$ must be the same, regardless of how it was computed. Hence

$$OP\frac{\sin\Sigma}{\cos\gamma}\,d\theta'' = OP\,\tan\gamma\;d\theta_1$$

$$d\theta_1 = d\theta''\;\frac{\sin\Sigma}{\cos\gamma\,.\,\tan\gamma} = \frac{d\theta''}{\sin\gamma}$$

$$\sin\Sigma = \frac{d\theta'}{\sin\Gamma}\sin\Sigma$$

What is true for turning angles also holds true for angular velocities ω' and ω'' about axes OC' and OC'', and for angular velocity ω_1 about the instantaneous axis, hence

$$(3)\quad \omega_1 = \frac{\omega'}{\sin\Gamma}.\,\sin\Sigma = \frac{\omega''}{\sin\gamma}.\,\sin\Sigma$$

Measured at right angles, point Q in Fig. 4 has a distance e from the instantaneous axis. Its sliding velocity v_s is the relative velocity of one gear with respect to the other at said point of contact. It is the product of distance e and angular velocity ω_1; $v_s = e.\omega_1$.

The velocity v at point P of the contacting pitch surfaces, due to rotation of the gears on fixed centers, is

$v = A\,\sin\gamma\cdot\omega' = A\,\sin\Gamma\cdot\omega''$; $A = OP$

$$\frac{\omega'}{\sin\gamma} = \frac{v}{A\,\sin\gamma\,\sin\Gamma} = \frac{\omega''}{\sin\Gamma};\ \text{hence}$$

$$(4)\quad v_s = e\cdot\omega_1 = v\cdot e\cdot\frac{\sin\Sigma}{A\,\sin\gamma\,\sin\Gamma}$$

$$(4a)\quad v_s = \frac{v.e}{A\,\sin\gamma\,\cos\gamma} = \frac{v.e}{A\,\sin\Gamma\,\cos\Gamma},\ \text{when } \Sigma = 90\ \text{deg.}$$

Transformation: $\sin\Sigma = \sin(\gamma+\Gamma) = \sin\gamma\,\cos\Gamma + \cos\gamma\,\sin\Gamma$

$A\,\sin\gamma = R'$; $A\,\sin\Gamma = R''$

$$\frac{\sin\Sigma}{A\,\sin\gamma\,\sin\Gamma} = \frac{\sin\Sigma}{R''\,\sin\gamma} = \frac{1}{R''}\left(\cos\Gamma + \cos\gamma\,\frac{\sin\Gamma}{\sin\gamma}\right) = \frac{1}{R''}\left(\cos\Gamma + \cos\gamma\,\frac{R''}{R'}\right) = \frac{\cos\Gamma}{R''} + \frac{\cos\gamma}{R'}$$

$$(4b)\quad v_s = v\cdot e\cdot\frac{\cos\Gamma}{R''} + \frac{\cos\gamma}{R'}$$

This formula also applies to gears with parallel axes, when the angles

In this first installment of a series some basic bevel gear formulas are rederived. Profile sliding is treated in a new way

γ and Γ are introduced as zero, $\cos\gamma = 1$ and $\cos\Gamma = 1$. It also shows that under otherwise equal conditions profile sliding is smaller on bevel gears than on gears with parallel axes, for $\cos\gamma$ and $\cos\Gamma$ are always smaller than one. On gears of equal radii and 45 deg. pitch angles, cos 45 deg. = 0.707 and sliding at the same distance e is only about 71 per cent of the sliding of spur gears with the same radii.

The angular velocity ω_1 about the instantaneous axis, and the pitch angles γ and Γ can also be obtained by a simple geometrical construction. In Fig. 5, line OK is drawn parallel to the pinion axis OC', and the angular velocity ω' about this axis is plotted as a distance OK. Thereupon line KL is drawn through point K parallel to the gear axis OC'', and the angular velocity ω'' about the gear axis is plotted on the same scale, in the direction shown, as a distance KL. Distance OL then measures the angular velocity ω_1 about the instantaneous axis. It also gives the direction of the instantaneous axis, which is parallel to straight line OL. The angles KOL and OLK are equal to the pitch angles γ and Γ.

In place of the angular velocities the turning angles per tooth could also be plotted. This construction fulfills the derived formulas (1), (2) and (3), and is known as geometrical addition of angular velocities. The resultant ω_1 is between the sum $(\omega' + \omega'')$ and the difference $(\omega' - \omega'')$ of the angular velocities ω' and ω'', depending on the angle Σ, included between them. The two limit cases represent gears with parallel axes, that is external and internal gear drives.

If the tooth shape of one gear is assumed, the tooth shape of the mating gear can be determined in principle. First, the tooth normal at any point of the given tooth surface is located. Said one gear is then turned on its axis until this tooth normal intersects the instantaneous axis. This is the position of contact, and the tooth surface point as well as the normal then belong to both gears. The point and its normal are now turned back about the axis of the mating gear, through a corresponding angle, which can be produced by turning the first gear back to its original position while it rolls with its pitch cone on the pitch cone of the mating gear. A point and the normal of the mating tooth surface is thereby obtained. This procedure may then be repeated for other points. Gears whose tooth surfaces are so related are conjugate gears.

A pair of tooth surfaces contact each other along a line at any one turning position within range. The common normals of the contacting tooth surfaces, at all points of this line of contact, pass through the instantaneous axis, so that this line can be considered the normal projection of the instantaneous axis to either or both tooth surfaces. The line of contact moves as the gears rotate, and it then sweeps the working portion of the tooth sides, which is their major part. The surface described in space by the moving line of contact is called the surface of action. There are two surfaces of action, one for each side of the teeth.

Conjugate Gears

Many conjugate gears can be found for a given gear, such as for the lower gear shown in Fig. 3. The axes of the gears considered all lie in the axial plane $C'\,OC''$ and pass through cone center O. The tooth number N_s and the pitch angle Γ_s of any such conjugate gear are related to each other like the tooth numbers N' and N'' and pitch angles γ and Γ of the first considered gear pair, namely

$$\frac{\sin\Gamma_s}{N_s} = \frac{\sin\gamma}{N'} = \frac{\sin\Gamma}{N''}$$

This is another way of saying that the pitch cone of this conjugate gear contacts the pitch cone of the other gear along instantaneous axis OP. Any such conjugate gear meshes with the lower gear along

the same surface of action as the shown upper gear centered at OC', for the shape of the surface of action depends only on the assumed tooth shape of the lower gear, and on the position of the instantaneous axis.

The teeth of the conjugate gear do not necessarily have to occupy the entire circumference. A gear segment may also be considered, in which case the tooth number N_s per complete circumference may also be a fractional number.

When the tooth sides of the gear having N_s teeth per full circumference are imagined to be infinitely thin, this gear can be interposed between the meshing gears having N' and N'' teeth at least when N_s is larger than N' and N''. The upper gear with N' teeth is then on one side of the infinitely thin tooth sides, and the lower gear with N'' teeth is on the other side. The two gears contact with the infinitely thin tooth sides and with each other along the same lines.

Prominent among such conjugate gears is the crown gear, whose axis OC_s in Fig. 3 is perpendicular to instantaneous axis OP. Its pitch angle is 90 deg. and its pitch surface is a plane. Instead of assuming the tooth shape of one gear of a pair of gears, the tooth shape of a third conjugate gear may be assumed. Two gears will be conjugate to each other when they are conjugate to said third gear on opposite sides of its infinitely thin tooth surfaces.

Assume Tooth Shape

The tooth shape of the third gear may be assumed so that one or both sides of a tooth can be described by a tool in a single motion. A plane, for instance, can be described by a reciprocating tool with a straight cutting edge, and a surface of revolution by a rotating tool. The third gear is then used to generate and produce the tooth sides of the gear pair, whereby the tool describes one or more tooth sides of the third gear and, while a feed motion is provided, as if the gear being generated would mesh with the third gear represented by the tool. When so used, the third gear will be called a basic gear, as its tooth shape forms the basis from which the tooth shapes of the gear pair are derived.

Instead of considering a basic gear with infinitely thin tooth surfaces, to which the two gears of a pair are conjugate on opposite sides of said tooth surfaces, pairs of basic gears whose teeth and tooth spaces completely match each other may be considered. The two members of these pairs of basic gears are complementary, and exact counterparts of one another. If the teeth are arranged on an external taper on one basic gear, they are disposed on an internal taper of equal angle on the other basic gear of the pair.

Fig. 6 is a view or a section through a pair of complementary crown gears; and Fig. 7 is a view or a section through a pair of tapered basic gears. A pair of gears with intersecting axes are conjugate to each other when the two gears are respectively conjugate to the two members of a pair of complementary basic gears. When meshing, these basic gears have the same cone center O and the same instantaneous axis OP as possessed by the gears.

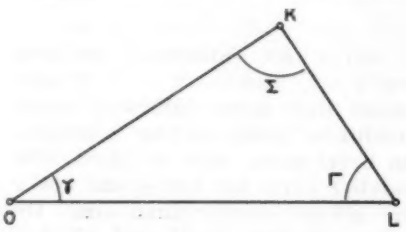


Fig. 5—The angular velocities of two mating gears can be geometrically added to give the angular velocity about the instantaneous axis and its direction

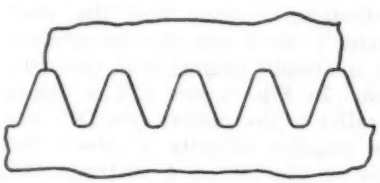


Fig. 6—Two bevel gears are conjugate when they are respectively conjugate to crown gears which are complementary. The two crown gears may have matching tooth surfaces of any kind but should be such that they can be described by a tool

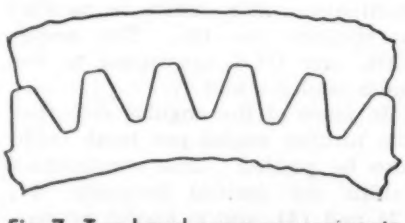


Fig. 7—Two bevel gears are conjugate when they are respectively conjugate to two complementary basic gears, whose tooth surfaces should be such that they can be readily described by a tool. One of the basic gears may be identical with the gear member of the gear pair

It is seen then that the gears can be produced without the necessity of determining their tooth surfaces in all detail. A relatively simple tooth form is assumed for the basic gears, and the mating tooth surfaces are then produced automatically in a generating operation.

Requirements for Conjugacy

The conventional straight tooth bevel gears are conjugate to basic crown gears which have plane tooth sides. The general run of spiral bevel gears are conjugate to basic crown gears whose tooth sides are surfaces of revolution. This is particularly true when these surfaces are conial in shape and can be described by straight cutting edges of a rotating face mill type cutter by suitable and convenient processes.

It is customary to cut both sides of a tooth space simultaneously on the gear member, that is on the larger member of a spiral bevel gear pair. The two sides of a tooth space are then generated conjugate to concentric surfaces of revolution, represented by cutting edges of the rotating face mill type cutter and leave a minimum chance for error.

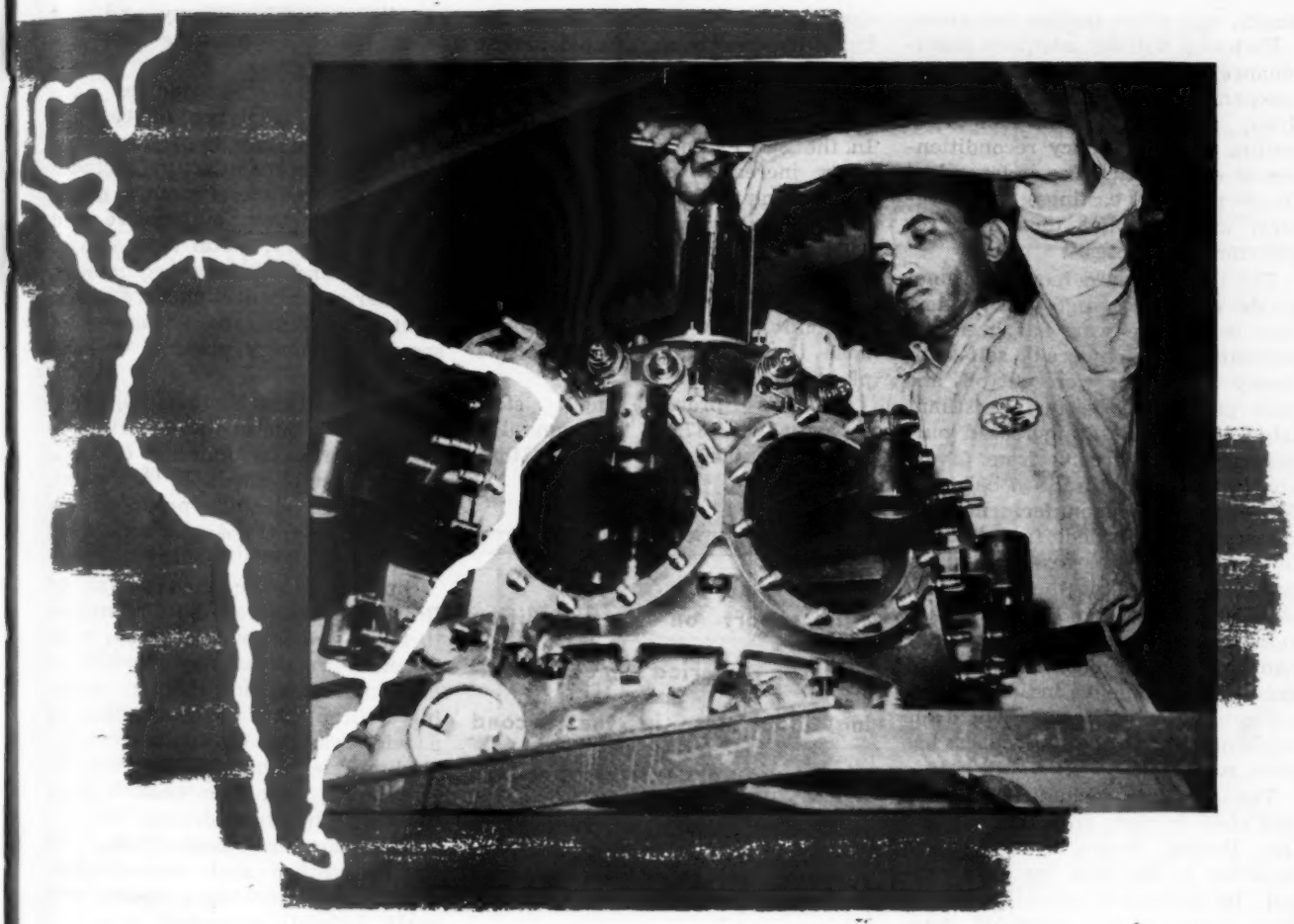
With gears of a pitch angle larger than about 70 deg. the tooth space differs only slightly from a tooth space which is the exact counterpart of the surfaces described by the cutter in its rotation.

Formate gears have tooth spaces which are the exact counterparts of the surfaces of revolution described by the rotating cutting edges. If the cutting edges describe conical surfaces, the profiles perpendicular to the cutter path are straight. The sides of a tooth space are then concentric conical surfaces.

The tooth sides of formate gears are cut without generating roll. This results in a faster gear production, and is therefore widely used for producing large quantities. Special gear machines are required to take advantage of the production assets and to obtain the highest accuracy inherent in the method.

Formate pinions are generated conjugate to the formate gears in an operation in which the cutter represents a tooth surface of the formate gear, a point which will be more fully discussed in connection with hypoid gears.

A second installment on bevel gears, describing the importance of relative curvature in relation to gear tooth surface strength will be published in an early number.



Latin American Industrial Expansion Boosts Demands for Machine Tools

BY J. SEWARD McCAIN AND GEORGE LOINAZ,
BUSINESS PUBLISHERS INTERNATIONAL CORPORATION

THE INDUSTRIAL status of Latin America at present backs up the large need for machine tools revealed by the surveys of Business Publishers International Corporation. Available economic data and special checks made by BPIC indicate that: (1) there is a large need for machine tools to process the output of the rising foundry and furnace capacity of these nations; (2) there is an accumulated need for replacement of badly worn equipment that has been repeatedly patched up during the war; and (3) plans for increased industrialization for many of these nations necessarily call for large numbers of machine tools and other equipment.

The general disposition of Latin-American industries is indicated in Table III, which classifies these various plants by type and by relative location. The 1,068 mining and petroleum companies listed include some of the largest and most modernly mechanized in the world, in some instances operating private industrial railways. Of the 546 railways listed, 315 of them operate more than 450,000 units of rolling stock over 90,000 miles of rail, and require large maintenance shops. The 4,044 central stations that generate power for municipal and industrial use also need maintenance shops.

In a similar manner, a large proportion of the manufacturing industries requiring power-driven machinery have their own maintenance shops. This includes sugar mills, flour mills, textile mills, shoe factories, paper mills, chemical

plants, and other similar industries.

Factories without adequate maintenance shop facilities look to the independent machine shops, foundries, and steel mills for both routine and emergency reconditioning of equipment. The independent shops produce castings and forgings, and machine them for replacement purposes.

The trend toward more consumer goods manufacturing, well underway before the war, has been accelerated by enforced self-sufficiency as imports were cut off, and with peace will be further stimulated as a result of increased purchasing power arising from favorable wartime trade balances. Although such manufacturing increases have varied from nation to nation, on an over-all basis it is safe to say that the gain is at least 30 percent over 1939. Yet, such gains have been scored without expansion or replacement of previously existing equipment, indicating the extreme wear and tear to which the equipment of these industries has been subjected.

The wartime reduction of iron and steel imports from Europe and the United States forced Latin America to increase its own output. Its peacetime annual consumption approximated 1,500,000 tons, mostly imported. In 1941, the two chief Latin-American producers, Brazil and Mexico, between them turned out less than 300,000 tons of steel.

New Steel Plant

Brazil is rushing completion of its mammoth Volta Redonda steel plant, which will have a steel-making capacity of 350,000 tons annually, or 150,000 tons more than all of Brazil's small charcoal furnaces produced before the war. A blast furnace with a 1,000-ton daily capacity, a boiler house and power house have been completed. Three open hearth furnaces are scheduled to be ready in September. A blooming mill to roll steel ingots into plate is scheduled for operation in November. Early in 1946, the rail and structural mill will come into operation, and by mid-1946 the sheet metal and tin plate mill will be operating.

Although this new capacity is not far below Brazil's prewar steel imports of 450,000 tons, it is not likely to replace that amount of imports. The reason is that Volta Redonda's full output could be absorbed in filling such essential needs as rails for the expanding railroad system and structural steel for buildings now being erected almost entirely from concrete.

Brazil's smaller iron and steel projects have also been expanding. In the Sao Paulo district there has been increased output of ferro-alloys. One producer has three electrical furnaces with a capacity of 5,000 tons annually. Single pieces up to ten tons can be cast. With its own equipment, this company has built a new large electric furnace that will almost double the plant's production.

Mexico's prewar ingot steel capacity was 137,000 tons annually. Its largest steel plant was the Monterrey Iron and Steel Company (100,000 ton capacity), turning out heavy items such as 100-lb. rails, beams and plates. La Consolidada, with a 37,000 ton capacity, turns out reinforcing bars and other light products. The newest Mexican steel mill, affiliated with the American Rolling Mill Company, has an annual capacity of 100,000 tons. Completed in 1944, it produces plates and sheet steel.

This report on the condition of Latin America's metal-working industries, in the second of a two-part series, bolsters favorable results of two BPIC surveys of this tool market

Projects still in the blueprint stage include the Chimbote steel mills in Peru, and others in Chile, Argentina and Venezuela. Colombia has established an Institute of Industrial Development to promote basic industries, and there are plans afoot to expand its iron and steel production, among others. The Chilean "Fomento" corporation is also aimed at industrialization of that country.

The recent expansion in Latin America's steel capacity, as substantial as it was, would have been greater were it not for war influences interfering with the procurement of equipment. The further increases planned will help round out the general economy and add to its potential machine tool demand.

Latin-American foundries are turning out all types of castings to serve the needs of local industries. This manufacture includes spare parts for diesel motors, gears, road construction, automotive and farm machinery, metal toys, valves, welding and mining equipment, cylinder axles, wheel and fire boxes, sanitary fittings, and a variety of special machinery peculiar to local industries.

Latin American castings are either machined in one of the departments of the particular foundry or in a separate establisment. In any event, the type of castings produced indicate the types of machine tools required to finish them.

Since 1935, the government of Brazil has encouraged its manufacturers to import metals, rather than finished products. As a result, a large metal-working industry is being built up for the production of a wide variety of appliances, including electrical, building, hardware, and plumbing, besides such items as wire, steel drums, tinplate, copper-ware, and many others. The war intensified such manufacture, which now includes replacement parts formerly imported.

The State of Sao Paulo ranks first in manufacture of metal products, accounting for 38 percent of the total, the Federal District follows with 27 percent, Rio Grande do Sul has 15 percent, and Minas Geraes 7 percent.

Foundry Shops Scattered

However, foundry shops are well scattered to meet the needs of local industries, and their castings output is at record levels. Sugar mill rolls account for most of the castings in the North, while foundries in the Central Section (mostly Minas Geraes) are producing maintenance castings for blast furnaces and steel mills. The balance of foundry production consists of general castings for the railways, replacement castings for machinery and power equipment, and for the facilities of agricultural products processing companies.

Approximately 400 machine shops are located in the Sao Paulo area. Some well established machine shops are capable of repairing and machining large cast iron gears and heavy cylinders for sugar and paper mills. Other repair work includes large turbines and steam jackets, heavy axles, propellers and propel-

TABLE III
LATIN AMERICAN INDUSTRIES CLASSIFIED

	ARGENTINA	BRAZIL	MEXICO	OTHER SOUTH AMERICAN COUNTRIES	CENTRAL AMERICA AND WEST INDIES	TOTAL LATIN AMERICAN COUNTRIES
Machine Shops, Foundries & Steel Mills	201	95	80	208	191	775
Mines	82	48	433	332	64	959
Petroleum Producers & Refineries	16	..	46	34	13	109
Cement Plants	14	17	11	24	2	68
Saw Mills & Woodworking Plants	280	225	103	165	182	955
Central Power Stations	1091	1127	171	1077	578	4044
Steam and Electric Railways	105	81	87	214	59	546
Sugar Mills	39	200	103	472	324	1138
Distilleries, Breweries & Bottlers	226	378	168	435	149	1356
Packing Plants	44	55	27	74	180	380
Vegetable, Fish & Animal Oil Processing	109	286	72	157	56	680
Canneries	32	46	19	74	73	244
Flour Mills	25	40	162	225	72	524
Textile Mills	140	431	210	199	41	1021
Paper Mills & Mfgrs. of Paper Products	69	94	90	86	21	360
Tanneries	51	240	120	205	96	712
Soap Factories	37	134	117	80	112	480
Shoe Factories	190	80	383	178	85	916
Medicinals & Toilet Preparations	109	246	322	246	135	1058
Chemical Plants	8	18	3	11	..	40
TOTAL NUMBER	2868	3841	2727	4496	2433	16365

This chart compiled by Business Publishers International Corporation from a variety of reliable sources.

ler shafts. Smaller shops machine medium and small parts from cast iron, bronze, aluminum, steel and copper, including wheels, shafts, transmissions, pulleys, connections, cylinders, bronze bearings and spare parts for industrial machinery. One well-equipped firm in Rio specializes in gear cutting, turning out good quality gears from cast iron or steel blanks.

Gray iron accounts for approximately 75 percent of all castings, consisting principally of stove parts, bath tubs, kitchen equipment, and special castings for local industries. Small size foundries predominate, but some of the largest ones can turn out castings up to 20 tons. Four companies are making malleable castings which consist most-

ly of fittings for pipes, wheel hubs, brake drums, and special parts for repair work.

Steel castings are confined to replacement parts. One third of the total is produced by a firm in Sao Paulo with a monthly output of from 400 to 500 tons. Most important castings are: pump impellers, turbine runners, and heavy gear blanks. Heavier manganese steel castings include switches, frogs, and crossings for street railway systems.

Three large foundries in Sao Paulo specialize in bronze and brass castings, accounting for 60 percent of this output. Products include water-meters, hinges, shutoff cocks, big valves for high-pressure piping, hose nozzles and connections, bathroom hardware, door locks, ornaments, and others. About four million dollars annually of common and centrifugally cast pipe are turned out by two foundries, one in Rio and one in Sao Paulo.

Tubing Production Small

There is also a small production of copper and brass seamless tubing, but seamless steel tubing is not yet being produced. Various local firms galvanize imported iron pipe. Locally produced sanitary ware is of fine quality and satisfies most of the demand. Moreover, the industry is expected to expand after the war. Stoves and furnaces are also manufactured in Brazil, with one of the largest plants having a monthly output of about 1,000 units. Six firms produce most of Brazil's kitchenware.

The metal-working industry of Mexico increased its output 61.8 percent between 1929 and 1939, while investments rose 102.5 percent. The war has brought further expansion aiding the nation's industrialization. Foundries and machine shops have been forced to turn out various parts and appliances formerly imported in order to support high production levels for various industries. The remarkable aspect of this development is that few shops are well equipped and raw material supplies have been usually limited.

Castings produced by Mexican foundries vary according to the dominant industry of the locality. Bars, bushings, engine brasses, journal bearings, pump impellers, and other castings for mines and smelters account for a large part of the total. Among the industries supplying work to the foundries and shops are included sugar mills and refineries, textile mills, oil wells and refineries, cement mills, and railway shops.

Castings are mostly confined to gray iron and steel. Two firms have a small production of aluminum castings, while brass and bronze castings are also being produced on a small scale by three other firms. Most of this output is spare parts for the mining and textile industries, castings for railroad maintenance, gratings, drains, and other parts.

There are 69 Mexican foundries producing gray iron castings (1939 output totaled 15,600 tons). The most important is Monterrey Steel Company. Some foundries are turning out standard products, such as grist mills, pulleys, and public lighting fixtures. Two companies have been formed to make malleable iron castings, but this is still in the experimental stage.

Steel castings are produced by La Consolidada (annual output 4,500 tons) and Monterrey Steel Company (annual output 4,000 tons). Several other concerns have small electric furnaces which could be used for making steel castings.

Few foundries are equipped with molding machines, most using hand-operated squeeze-type machines. Some foundries have specialized in enameled cooking utensils, stoves and furnaces, and sanitary ware, such as bathtubs, wash basins, and flushing boxes.

Most repair parts and replacements for diesel engines are made locally, including pistons, cylinders, cylinder lines and heads. A leading foundry doing such work also makes special tools for handling it.

The pipe-making industry is distinguished for its cast iron pipes, welding steel tubing and wrought iron pipes. Copper brass pipes, steel seamless tubing, or black iron pipes are not yet produced.

Argentine foundries and machine shops have increased their production to the limit of available imported raw materials. Some of these firms are well equipped with lathes, hydraulic presses, and many other machine tools, as well as electric welding equipment.

Argentine machine shops specialize in repair work involving forging and welding, and in making spare parts for diesel engines, automotive, agricultural, and road-building machinery. Small shops are making nut, bolt, and screw-making machinery.

There are over 200 firms making gray iron castings, using imported pig iron and available scrap. Such castings do not compare with similar European or American standards. Four firms can make castings weighing over 3,000 lb. Malleable iron castings are not made in Argentina. A few firms make steel castings of a maximum size of 1,000 lb., but at least three make castings weighing over three tons.

In 1941, there were 30 brass and bronze foundries in Argentina, and 76 others turning out various castings in brass, bronze, and other nonferrous metals. Some 20 firms around Buenos Aires are casting aluminum, with scrap yielding one-third of the raw material.

Local production of cast iron pipe amounts to 20,000 tons annually, or about two-thirds of total demand. Raw material comes principally from the United States and Brazil, with cast iron imports ranging between 10,000 and 20,000 tons annually. In normal times about 5,000 tons of iron pipe are galvanized, but there is no manufacture of it.

About 1,000 tons of copper and brass seamless tubing is produced annually, including almost all types and sizes, except capillary tubing. There is no manufacture of steel seamless tubing.

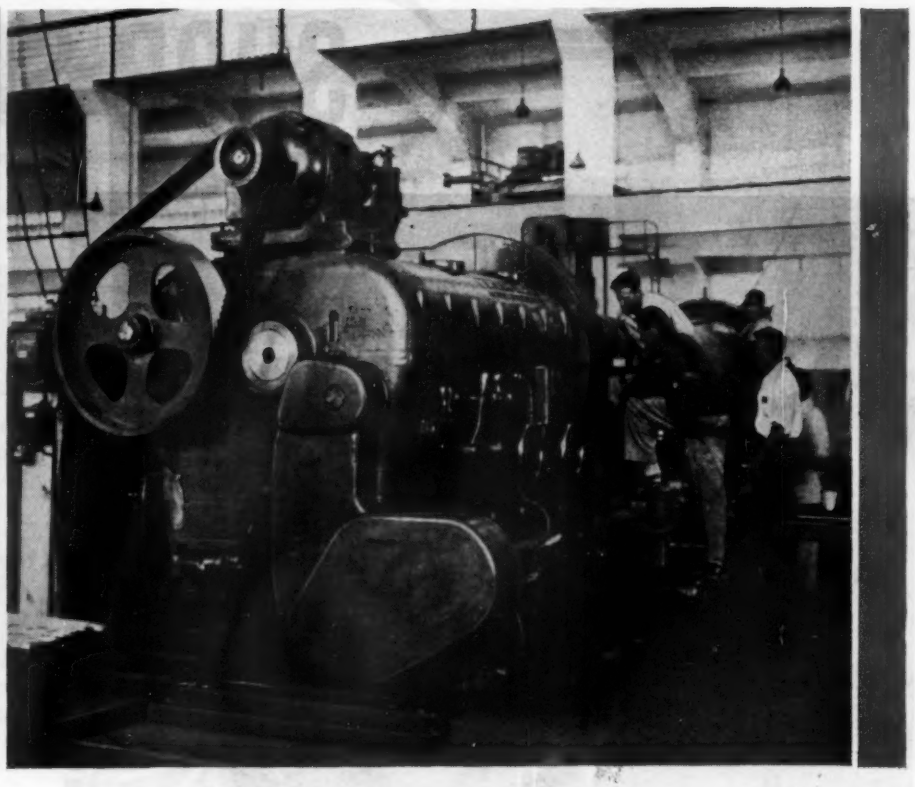
Steel forgings for the railways and diesel engines are being made in several establishments. This output includes crankshafts, weighing over two tons, and railroad coupling hooks, hubs, and axles. Gears have been manufactured in Argentina for the first time from forgings made locally, but its continuance is doubtful because of its high costs.

The other Latin-American nations have fewer and, for the most part, smaller foundries and machine shops than Brazil, Mexico, and Argentina. Repair work and replacement parts for local industries predominate. However, these nations are trying to increase output of many consumer durable goods.

New Industries Starting

Already, many new industries including airplane and motor plants, are being established in these nations involving rather complex production and equipment in comparison with the general type of industrial activity previously carried on.

In Brazil, the newly organized Fabrica Nacional de Motores is turning out counterbalances for crankshafts and other parts. Heat-treating equipment and other modern machinery is being installed in this plant. Most of its output



Latin America's power plants are well equipped, and new projects will be even better equipped. This horizontal boring mill is machining the case of an hydraulic turbine in the Rio shops of the Brazilian Traction, Light and Power Co.

will be 450 hp. Wright whirlwind engines and 6-cylinder in-line, air-cooled Fairchild Ranger models. Some replacement parts will be produced, including cylinders, crankshafts, crank cases, oil pumps, gears, gaskets and connecting rods.

The Henrique Lage airplane factory in Rio de Janeiro is building trimotored 10-passenger transports with 130 hp. Franklin motors. The Central railroad shops of Brazil have successfully manufactured diesel motors for sub-chasers with local materials. Brazilian production of electric motors has increased 100 percent every year since 1940. Polyphase motors from one-half to 50 hp. are the principal type.

An army aircraft factory established in 1927 in Cordoba, Argentina, has built several high-powered engines, and recently manufactured a monoplane trainer with an 80 hp. Continental motor. Several other trainers have been turned out, and more are under development.

Fractional horsepower motors are being turned out by several Argentine firms. At least one concern is making three-phase squirrel cage induction motors, from 1 to 7½ hp. in size, on Westinghouse designs. Synchronous motors up to 700 hp. are made on special orders.

For several decades, North American companies have been establishing branch plants in Latin America. Recent examples include new aluminum factories being installed by Reynolds Metals throughout Latin America; the International Harvester's $1,200,000 agricultural implement factory to be built in Mexico; the new tire factory built by General Tire & Rubber Company in Chile and the one in Colombia built by B. F. Goodrich; Freeport Sulphur's new $30,000,000 nickel subsidiary in Cuba; Monsanto Chemical's plants in Brazil, and so on.

Technical Training Increases

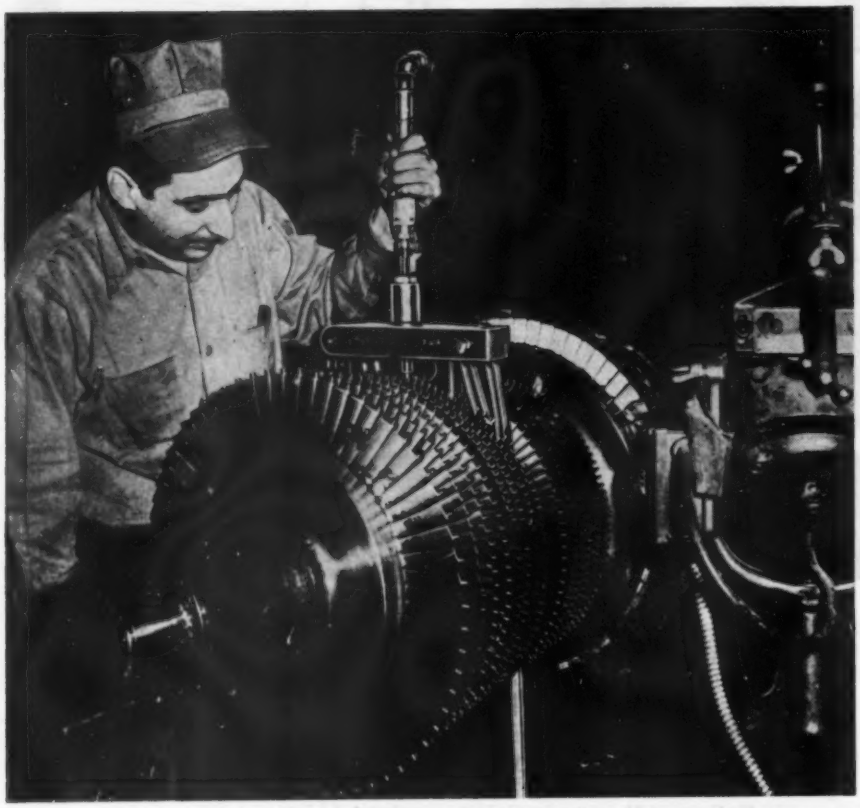
Since these companies send along skilled technical men to supervise such operations, this situation helps the spread of technical knowledge through these nations. Under a special program, hundreds of young Latin Americans have been brought to the United States for technical training. Aside from this, the ranks of skilled labor in Latin America have been increased by wartime immigration from Europe and the recent training of thousands of workers to help push up industrial production.

The Research Division of the Office of the Coordinator of Inter-American Affairs recently estimated that there is some $7,000,000,000 worth of production machinery and equipment in use in Latin America, including power and transportation facilities, construction, lumbering, petroleum, mining and agricultural equipment, and machinery for manufacturing and consumer goods production. Industrial expansion over the next decade is estimated to require $7,000,000,000 in additional equipment, and replacements will add $2,800,000,000 to that total. Of this, about $5,780,000,000 will be required from the United States, of which $4,160,000,000 will be in new equipment, and $1,620,000,000 will be in used equipment. Of this enormous total, it was estimated that manufacturing equipment needs alone would come to $788,700,000 in new units and $357,700,000 in used equipment.

Although these optimistic figures are based upon the assumption of highly favorable economic conditions affecting the trade between the United States and Latin America, they indicate the maximum potential for American equipment producers. Brazil was rated as the leading prospective market, with Mexico, Argentina, Chile, Colombia, and Peru following in that order. These nations would take 80 percent of the total.

The conclusions are inescapable: Latin-American industry is expanding in size and scope; its replacement needs for machine tools and other equipment alone are substantial; its accumulated unfilled demand is large; its financial condition is greatly improved; and the United States is in a most enviable position to supply this market.

SHOP SHOTS



A blade repegging tool eliminates variation in the height of turbine spindles and facilitates assembly of the shroud over the blade ends. The tool consists of a jig which locates on the O.D. of the spindle and straddles a row of blades. A slip bushing is positioned in relation to the contact points and radial to the spindle center. Two leather straps circle the spindle and hold the jig in position. A hollow mill cutter mounted in a special holder is a running fit in the slip bushing in the jig. An adjustable collar, mounted on the holder, regulates the depth of cut. The jig is positioned and the mill is run down over the peg, trimming the shoulder to required depth. Tool and holder is driven by a flexible shaft machine. The jig can be moved from blade to blade without loosening the belt tension. *E. A. Isberg, Westinghouse Electric Corporation.*

A swinging toolhead attached to a shaper is used to provide required clearance on one side of breech blocks for 155 mm. field guns. The swinging arm is actuated by the shaper ram and is supported by the shaper base. The feed of the toolhead is controlled by a solenoid mounted at the back of the swinging member. An air cylinder between the tool and rocker counterbalances the swinging arm, acts as a cushion and helps return the toolhead to its upright position. The work is held in a heavy fixture fastened to the shaper base. *Mesta Machine Company.*

Operator and equipment safety is increased by this electronic control set-up. The boring tool at the right can't move in to finish bore the I.D. of the gear as long as the aligning plug is in position, or even while the operator is removing the plug. The light beam to the photo-electric cell is interrupted by this plug and the circuit is arranged so that the machine cannot be started while the plug is in place. *Michigan Tool Company.*

Accurate positioning of spotwelds in the welding of fireseal rings in manifold tubes is accomplished by means of a guide-collar which is placed over the electrode and clamped. Formerly the ring was jig-tacked into position and then spotwelded, in staggered fashion, at the point of overlap between the ring and the tube. This was difficult as the ¼-in. spotwelds had to be centered in an overlap ⅜ in. wide, resulting in frequent welding of the edges of the overlap. Now the tube and fireseal are placed against the guide for positive location. *F. E. Dungan, Ryan Aeronautical Company.*

Protection of cutting edges on radial drill press tools is greatly facilitated by mounting a sheet-metal rack under the radial arm of the drill press to hold the tools and their quick-change chuck drivers. Notches cut in the flanges of the rack insure spacing of the tools to prevent contact of the cutting edges with other objects. Similar racks have been mounted on column-type production drill presses used in the same plant. *Caterpillar Tractor Company.*

Special Duplex Saw Squares Extrusion Ends Accurately

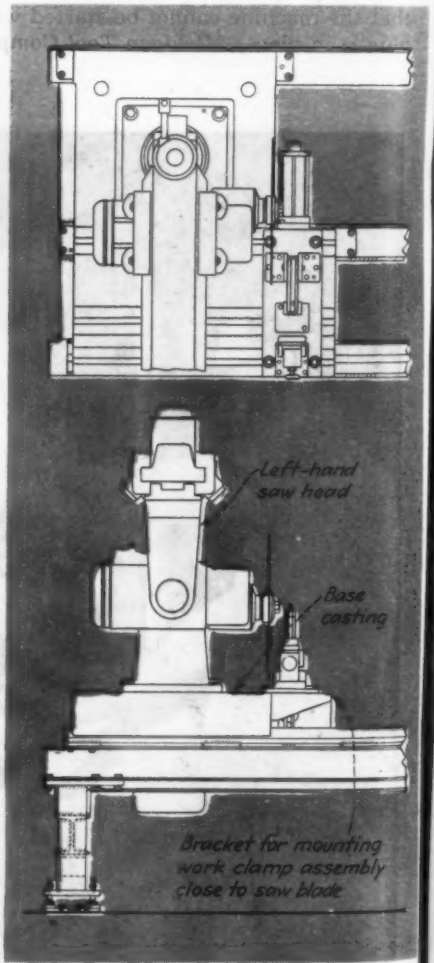
The control station for the two saw heads of the spar chord cutoff saw is located 36 in. away from the left-hand head so that the operator is safely away from both heads during the sawing cycles. Automatic electric interlocks provide additional accident insurance. A dust collector system on each head solved the chip control problem

BY LEON MOORADIAN, BOEING AIRCRAFT COMPANY

MASS PRODUCTION of the Boeing B-29 *Superfortress* bomber at the Seattle and Renton plants of the Boeing Aircraft Company has made necessary the development of a number of special machines for manufacturing operations on the many parts required for these huge war planes. A special spar chord milling department has been set up in the Renton plant for the complete machining of these important wing parts. Production requirements have made necessary the development of equipment suitable for higher production rates than usually are found in spar chord machining departments at other aircraft plants.

Normally, spar chords are located for the various longitudinal and scarf milling operations by means of accurately drilled locating pin holes in each end of the spar chord extrusions. Studies have indicated that location of these extrusions in the various machining fixtures can be speeded up if the extrusions are located lengthwise from machined end surfaces which can be butted against accurately located stops. Therefore, in setting up the spar chord machining department in the Renton plant, it was decided to develop a special duplex saw which will accurately square both ends of a spar chord section with one setting of the workpiece. Minimum stock lengths specified for the different extruded chord sections for the B-29 bomber range from 103 to 370 in., so the duplex saw must be adjustable to take these lengths between the two saw blades.

Accompanying illustrations show how the design of this special sawing machine was worked out by Boeing tool engineers. Basically, it consists of two No. ME-2 DeWalt sawing heads mounted on a welded steel frame, the left-hand saw head being fixed in position and the head at the right-hand end being adjustable longitudinally along the ways



of the bed by means of rack and pinion to give a maximum setting between the saw blades of 380 in. Minimum setting between blades is about 40 in. under normal operating conditions, but they can be brought closer together if necessary.

The saw head, in each case, has 18¾-in. horizontal travel along the overarm which can be adjusted vertically 16½ in. Each saw spindle is driven at 1,800 r.p.m. by a 10-hp. motor mounted integral with the saw head. Design of the saw head overarms was changed to incorporate special steel tracks to minimize the wear due to longitudinal travel of the head along the overarm. Each saw head carries a 20-in. diameter, 120-tooth circular carbon steel blade which is 0.160 in. wide. It is hollow ground all of the way to the periphery to provide side clearance. Teeth on these saw blades are ground with 15-deg. hook and 0-deg. helix angles. Blades are removed for resharpening after each 60 to 70 cuts to insure clean, smooth end surfaces on the chord sections.

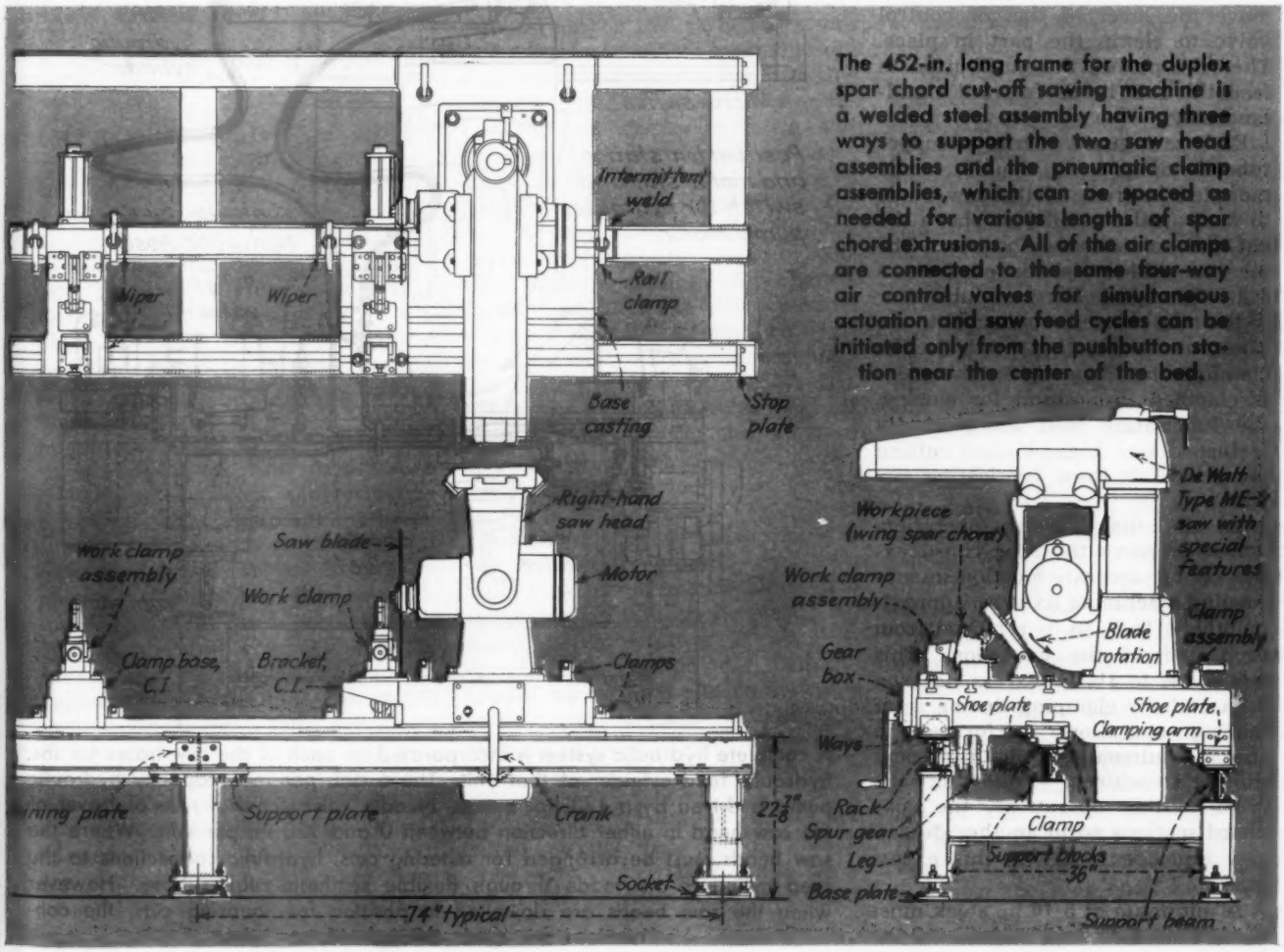
Both saw heads can be swiveled to any required angle and the cross arms can be swiveled above the support column for mitering cuts. When the machine is to be used only for squaring cuts on wing spar chords, preceding other machining operations, the heads and arms are dowelled in position to prevent shifting of the adjustable units from the correct position. The right-hand head can be arranged with power longitudinal feed for slitting operations, should they become necessary. The design provides for the addition of a drive motor and the necessary gearing for such longitudinal feed.

Pneumatic clamping units are used for adequate support at the cut. The saw heads swivel to required angles and safety devices protect the operator

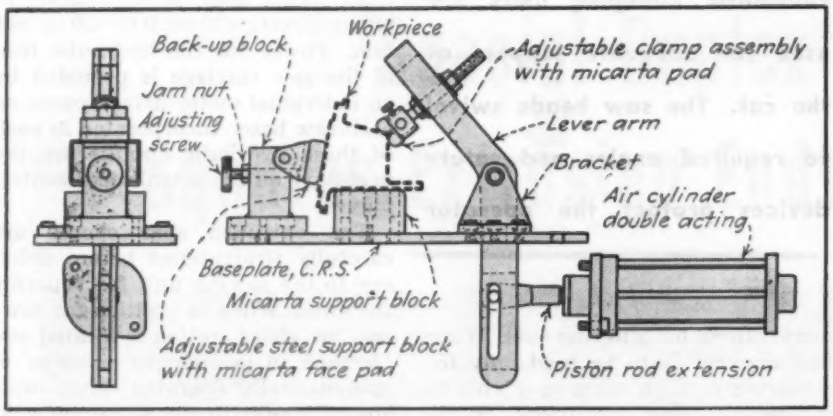
On both heads the conventional chain cross-feed for the saw head along the crossarm has been removed and an integral hydraulic feed has been provided for each saw head. This feed is adjustable in either direction from 0 to 120 in. per min. Power for the hydraulic feed of the saw carriage is provided by an individual motor-driven pump on each saw base. Incorporated in each of these hydraulic circuits are the necessary oil sump tanks and control valves.

The extruded spar chords are carefully straightened before delivery to the sawing unit for squaring the ends. When in position for sawing, the chord section is located and clamped in position by a series of pneumatically operated clamp units spaced longitudinally along the ways of the machine base. One of these air clamp units is mounted on each of the saw bases close to the saw position so as to provide adequate support at the cut. With air line pressure of 95 to 100 lb. per sq. in., the clamping pressure at each of these units is 350 to 400 lb. Each of the clamp units incorporates special Micarta laminated plastic support blocks and clamp pads to avoid damage to the surfaces of the extrusions under clamping pressure.

All of the air clamps are operated simultaneously from a single four-



The 452-in. long frame for the duplex spar chord cut-off sawing machine is a welded steel assembly having three ways to support the two saw head assemblies and the pneumatic clamp assemblies, which can be spaced as needed for various lengths of spar chord extrusions. All of the air clamps are connected to the same four-way air control valves for simultaneous actuation and saw feed cycles can be initiated only from the pushbutton station near the center of the bed.



The Micarta laminated plastic support blocks and clamp face pads are changed for the various shapes of wing spar chord extrusions. The type shown are satisfactory for lower spar chord units, but the smaller upper spar chord extrusions for the B-29 bomber require specially shaped support blocks

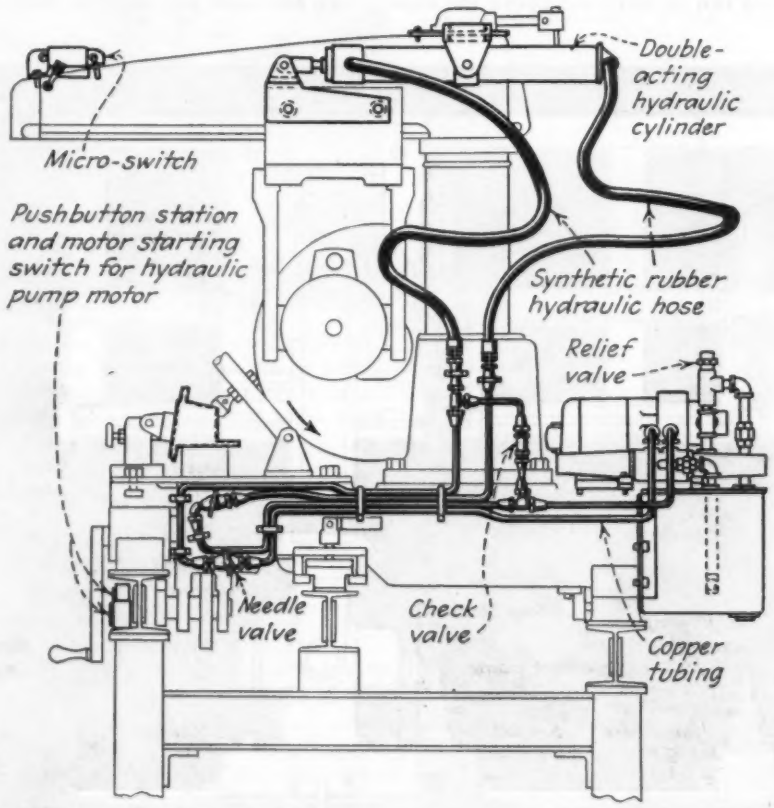
way air control valve mounted at the front of the machine bed. Beside this air control valve is the single pushbutton control station which operates the hydraulic feed unit at each saw head. Once a spar chord section has been positioned on the supporting pads on the clamps, the operating cycle calls for the operator to start each saw-spindle motor, then go to the control position and move the lever of the air control valve to clamp the part in place. Then, he pushes the pushbutton to feed the saw heads forward simultaneously.

Each saw guard carries a copper tube leading to a double nozzle mounted in front of the saw blade to feed a mist of oil just above the cut and so lubricate the saw. The air line which siphons oil from a tank through a Norgren lubricator to the mist nozzle is connected to the same air valve that controls the clamp units. Thus, when the piece is clamped in position for sawing, the lubricating mist automatically is turned on. Light-bodied cutting oil is used in these lubricating circuits.

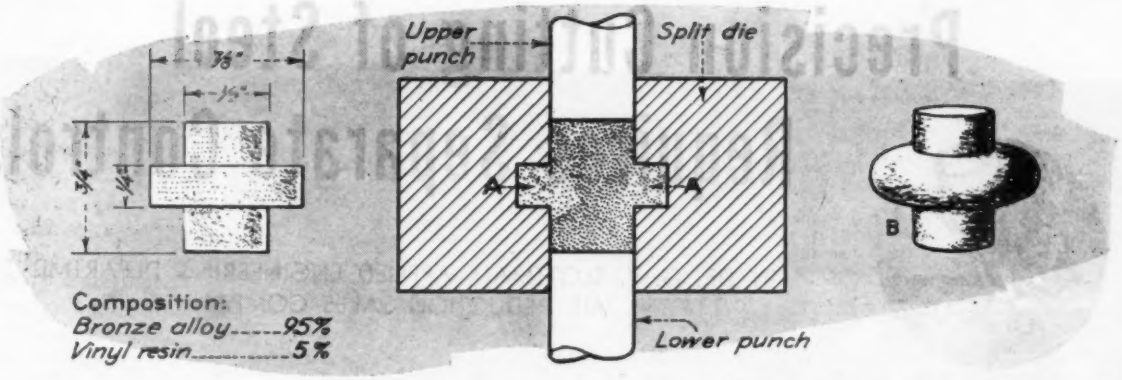
In the first sawing operation, which prepares the spar chord extrusion for accurate location in succeeding machining fixtures, approximately ⅜ to ½ in. is removed from each end of the extrusion. This leaves 1¾ to 4¼ in. excess stock on each end for clamping during scarf milling operations performed in special automatic-cycle Sunstrand milling machines. Following the scarf milling operations, the spar chord sections go to another duplex saw unit for removing this excess stock.

A minimum of 3/16 in. stock must be left at each end, outside of the saw blade, for the first cut-off operation to prevent the saw from "wandering" during the cut. Usually, sawing feed is approximately 12 in. per min. and saw head return is at the rate of 65 to 80 in. per min. The largest spar chord extrusion, made of 24 S-T aluminum alloy, has a cross-sectional area of 17 sq. in. and it takes approximately 70 sec. to make a complete cut-off sawing cycle on the largest extrusion with the medium carbon circular saw blade now employed. The machine is capable of driving two 20-in. diameter, ¼-in. carbide tipped saw blades and it is expected that this sawing time can be reduced materially when such blades are employed.

Release of the feed pushbutton automatically retracts both saws to the starting position. An adjustable limit switch is mounted in front of each overrun, and these limit switches are connected in parallel so that the saw heads automatically are retracted when both saws reach the forward end of their feed, regardless of whether the operator keeps the feed pushbutton depressed after the end of the forward stroke is reached. Limit switches also connect to an electrical timer so that the feed cycles cannot restart until after a definite time delay.



A complete hydraulic system is incorporated on each of the saw bases for the hydraulic feed cylinder of that unit. The 6 gal. per min. capacity hydraulic pump is driven by a 1/3 hp. motor. Needle valves control rate of travel of the saw head in either direction between 0 and 120 in. per min. Where the saw heads must be arranged for mitering cuts, hydraulic connections to the feed cylinders are made through flexible synthetic rubber hose. However when the saw heads are dowelled in position for squaring cuts, the connections are made through copper tubes



To overcome resistance of powder metals to lateral flow in a die, and thus to avoid porosity in sections such as A, the author worked out a method for mixing vinyl plastic with the powder and compacting in a heated die. An iron part of the shape shown at B was also successfully made.

Plastics Increase Powder-Metal Flow

BY HARRY L. STRAUSS, JR.
NATIONAL DIAMOND HONE & WHEEL COMPANY

Limitations upon part shape are reduced by using a plastic as a liquid vehicle and then burning it off before final compacting

IMPROVED FLOW of powder metals in a briquetting die can be achieved by adding approximately 5 percent of synthetic resin by volume and employing heat during the compacting cycle. At room temperature, the resin is a dry flour; when heated to approximately 150 F., the plastic becomes semi-fluid and the resin-powder metal mixture readily flows into the die recesses under moderate pressure. Then, if the temperature is subsequently raised in excess of 700 F., and the pressure is likewise increased, the resin decomposes. If at this point the pressure is released momentarily, the entrapped gases escape from the partial compact, but the powder-metal particles are undisturbed. Finally, the full compacting pressure is applied, and the briquette is removed from the die. The entire cycle takes about 3 min. per piece, or less.

The plastic vehicle for the powder metal should be selected with two factors in mind; completeness of decomposition and effective die temperature. Some resins are more prone than others to leave carbonaceous deposits and some will cause blowholes because of chemical breakdown and formation of new compounds. The temperature that will effect rapid and complete decomposition of the resin is important because of effects upon the die material. Most plastics begin to decompose at 500 to 600 F. The reaction should be completed—and speedily—by a maximum temperature of 775 F. Vinyl-type resins appear to be most satisfactory for the purpose. Experiments disclose that 5 percent of vinyl resin by volume achieves suitable flow characteristics, so that the powder-metal charge will flow "around corners" and completely fill die recesses without voids. If more plastic is used, blowholes are likely to appear; if less is supplied, the desired flow characteristics may not be achieved.

Two critical factors must be observed with this process: (1) proper selection of die material and (2) the method of mixing the resin with the powder metal. Since partial decomposition of the plastic requires a temperature of approximately 750 F., the die material should be a high-chromium alloy or cast steel to resist drawing and wear, or a carbide-lined die can be used if production requirements demand it.

A special technique is needed when mixing the powder metals and resin. The latter must be a finely ground flour of say 200 mesh, and must be dried thoroughly to remove any moisture content. In mixing, a slow rotative speed of the equipment is necessary to avoid work hardening the metal particles and embrittlement of the sintered compact. Improper mixing is revealed after compacting by a non-uniform conglomerate which may contain carbonaceous masses or even molasses-like inclusions.

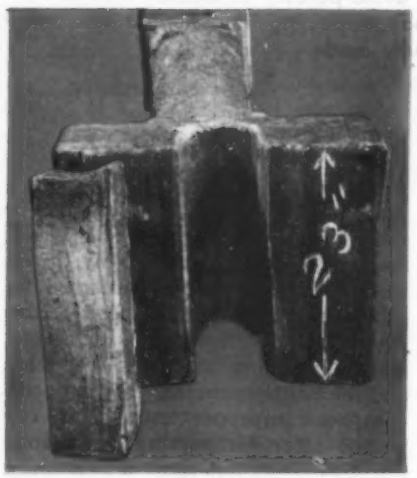
The complete cycle for successful production of powder-metal parts with vinyl-resin additives is:

Fill die with properly mixed material. Apply heat to die by suitable means: that is, by electric heaters or induction. Allow temperature to rise to approximately 150 F. while maintaining punch pressure of 500 to 1,000 lb. p.s.i. At this temperature, the plastic becomes semi-fluid and seeks to fill the die recesses, carrying with it the powder metal. Now raise the die temperature to 750 F. and gradually increase the pressure to 6,000 p.s.i. Then release the pressure momentarily to "breathe" the compact, or let the entrapped gases of decomposition escape. Finally, apply the full compacting pressure, which depends upon the final porosity desired. Since the carbonaceous residue of a suitable resin is slight, the overall porosity of the compact will be only somewhat less than that of one made conventionally. Then remove the compact from the die and transfer it to the sintering furnace.

Improvement in strength and density of the powder-metal part can be achieved by a partial sintering operation after compacting, then recompacting and final sintering.

Precision Cutting of Steel Requires Separate Controls

BY DR. G. V. SLOTTMAN, APPLIED ENGINEERING DEPARTMENT
AIR REDUCTION SALES COMPANY



Heavy cuts are unavoidably less smooth than the quality obtainable on thinner material. This 23-in. cut on a marine connecting rod shows typical quality in heavy cutting, though the melting of the top edge is excessive. Smoothness and tolerance are equivalent to rough machining

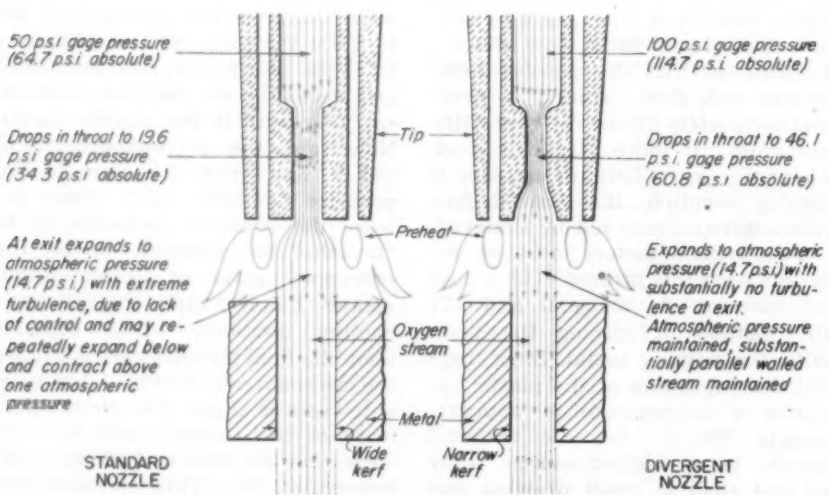
An accurate knowledge of kerf widths, thermal expansion and plate motion are important in precision operations. This is the sixth article in a series

QUALITY OF CUTTING refers primarily to the smoothness of the cut face. Accuracy of line and dimension of the completed part is frequently regarded as an element of quality, but in this discussion accuracy will be treated as a separate factor. This is logical since it is entirely possible to produce a high-quality cut which is inaccurate. The controls which are necessary to insure high-quality cutting contribute only partially to an increase in accuracy of dimension. Separate controls and precautions must be followed to promote precision, and these have little effect upon quality.

The analysis, thickness, surface condition and homogeneity of the steel influence the maximum quality of cut which it is possible to obtain on a given piece of material, but within these limitations the quality actually secured depends upon the skill of the machine operator.

Correct adjustments of pressures and speeds, as outlined in a previous installment, can be made to produce extremely smooth cuts at moderate speed, or cuts of lower quality at higher speed. On thicknesses up to 6 in. the squareness and finish are at least equal to the results obtained by rough machining, and for many purposes the cut parts are used without finish grinding or machining. Above 6 in. the smoothness obtainable becomes less as the thickness increases, and in the heavy sections it is not possible to secure a really high-quality cut.

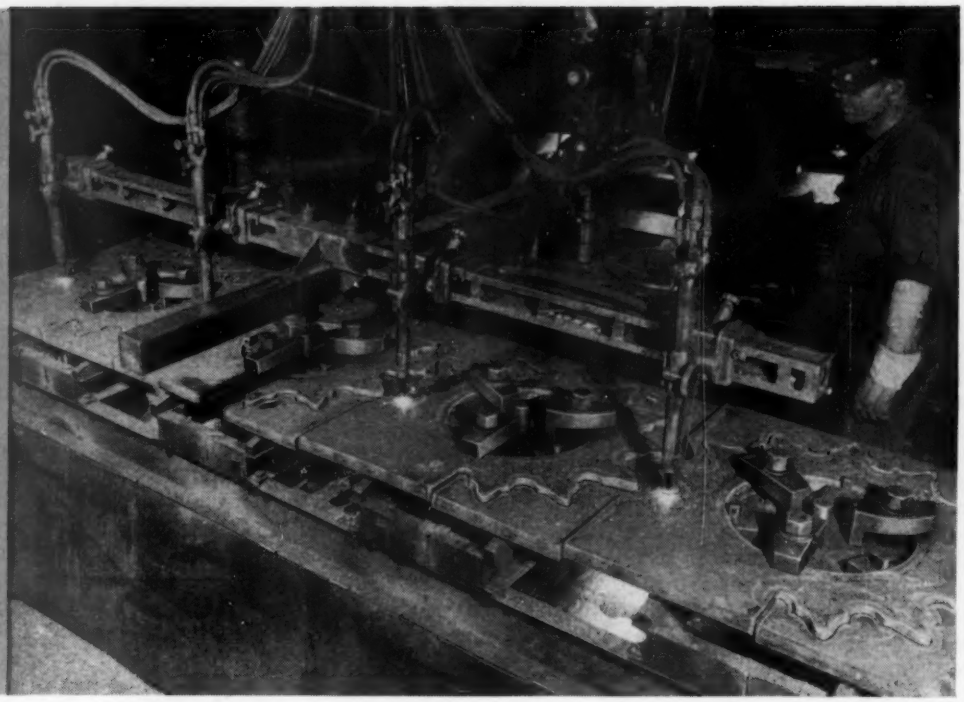
For the more common thicknesses it is customary to use the arbitrary terms "high-speed cutting" and "high-quality cutting" to designate the extremes of the range of cutting conditions available. As the terms imply, high-speed cutting is used when smoothness may be sacrificed in the interests of obtaining the maximum linear cutting per hour and per cubic foot of oxygen; high-quality cuts sacrifice speed and gas economy for smoothness. The figures given in Table I comprehend both types of cutting, listing speeds and gas consumptions for various thicknesses of steel.


50 p.s.i. gage pressure (64.7 p.s.i. absolute)
Drops in throat to 19.6 p.s.i. gage pressure (34.3 p.s.i. absolute)
At exit expands to atmospheric pressure (14.7 p.s.i.) with extreme turbulence, due to lack of control and may repeatedly expand below and contract above one atmospheric pressure
Tip
Preheat
Oxygen stream
Metal
Wide kerf
Narrow kerf
STANDARD NOZZLE
100 p.s.i. gage pressure (114.7 p.s.i. absolute)
Drops in throat to 46.1 p.s.i. gage pressure (60.8 p.s.i. absolute)
Expands to atmospheric pressure (14.7 p.s.i.) with substantially no turbulence at exit. Atmospheric pressure maintained, substantially parallel walled stream maintained
DIVERGENT NOZZLE

These schematic diagrams show the expansion of the cutting stream as it leaves a standard tip and a divergent nozzle tip. The oxygen is under some pressure in the exit channel of a standard tip, and expands at exit, to atmospheric pressure. In the divergent nozzle this expansion is controlled within the tip, discharging the gas at atmospheric pressure. The result is a narrower kerf. Higher cutting speeds or reduced oxygen consumption, both of the order of 20 to 30 percent, are thereby secured

Special Tip Controls Jet

Table II lists the conditions of cutting when using the recently developed divergent nozzle cutting tip. This special tip controls the expansion of the jet of cutting oxygen, thereby cutting a narrower kerf at greater speed than standard tips. Oxygen consumption is proportionately less, on the order of 15 to 25 percent, while speeds are increased



A practical application of the theoretically ideal method of supporting the plate at a single point in the center. This jig table holds four separate pieces by means of centering clamps at previously cut circular holes. The tank sprockets being cut are firmly held while the scrap is free to walk. Distortion is thus confined to the scrap, and the sprockets are extremely accurate. The centering clamps also assure correct reference between circle and sprocket outlines

TABLE I—PRODUCTION DATA FOR STANDARD MACHINE CUTTING

USING AIRCO STYLE 124 TIPS)

Metal Thickness, Inches	Cutting Tip Size	Pressure psi		Cutting* Speed In. per Min.	Approx. Kerf Width	Gas Consumption (Cu. Ft.) Per Hour		Per Linear Foot Cut	
		Oxygen	Acetylene			Oxygen	Acetylene	Oxygen	Acetylene
¼	0	30	3	20-24	0.075	50	9	0.50- 0.42	0.09-0.08
⅜	1	30	3	19-23	0.095	75	12	0.79- 0.65	0.13-0.10
½	1	40	3	17-21	0.095	90	12	1.06- 0.86	0.14-0.11
¾	2	40	3	15-18	0.110	120	14	1.60- 1.33	0.19-0.16
1	2	50	3	14-17	0.110	140	14	2.00- 1.41	0.20-0.16
1½	3	45	3	12-14½	0.130	185	16	3.08- 2.55	0.27-0.22
2	3	50	3	10-12	0.130	200	16	4.00- 3.33	0.32-0.27
2½	4	50	3	9-11	0.145	250	17	5.55- 4.55	0.38-0.31
3	5	45	4	8-10	0.165	310	22	7.75- 6.20	0.55-0.44
4	5	60	4	7-8½	0.165	385	22	11.01- 7.30	0.63-0.52
5	6	50	5	6-7	0.190	460	28	15.33-13.14	0.93-0.80
6	6	55	5	5-6	0.190	495	28	19.80-16.50	1.12-0.93
8	7	60	6	4-5	0.220	645	35	32.25-25.80	1.75-1.40
10	7	70	6	3½-4	0.220	735	35	42.00-36.80	2.00-1.75
12	8	70	6	3-3½	0.260	875	40	58.30-50.00	2.67-2.29

TABLE II—MACHINE CUTTING WITH "HIGH SPEED" TIP

(USING AIRCO STYLE 45 TIPS)

¼	0	120	3	26-28	0.050	70	14	0.54- 0.50	0.11-0.10
⅜	1	85	3	24-26	0.065	85	18	0.71- 0.65	0.15-0.14
½	1	100	3	22-24	0.065	100	18	0.91- 0.83	0.16-0.15
¾	2	100	3	20-22	0.075	120	18	1.20- 1.09	0.18-0.15
1	2	110	3	18-20	0.075	130	18	1.45- 1.30	0.20-0.18
1½	3	100	4	16-18	0.085	170	25	2.12- 1.89	0.31-0.28
2	4	100	4	13-15	0.105	230	25	3.54- 3.07	0.38-0.33
2½	4	110	4	12-14	0.105	245	25	4.08- 3.50	0.42-0.36
3	6	85	4	10-12	0.120	270	32	5.40- 4.50	0.64-0.53
4	8	85	4	9-10	0.135	330	35	7.33- 6.60	0.78-0.70
5	8	110	4	8-9	0.135	395	35	9.87- 8.78	0.88-0.78
6	8	125	4	7-8	0.135	435	35	12.43-10.87	1.00-0.88
7	10	80	4	6-7	0.170	495	36	16.50-14.14	1.20-1.03
8	10	100	4	5½-6½	0.170	580	36	21.10-17.85	1.31-1.11

*Lowest speeds are for high quality cutting, involved contours, inexperienced operators, low cutability steel, or poor surface condition. Highest speeds are for lower quality cutting, straight-line work, efficient operators, high cutability steels, clean surfaces. The high speeds are accompanied by reduced gas consumption per linear foot, as listed in right-hand halves of gas consumption columns. Intermediate cutting conditions require medium speeds and gas consumptions.

by the same amount without sacrificing quality.

The degree of accuracy as to cross-sectional squareness obtainable under the best conditions is given in Table III. These precision tolerances should not be expected in run-of-mill work, yet they are somewhat coarser than the ultimate attainable.

High precision cutting of shapes requires an accurate knowledge of kerf widths, since the templet must be made with an allowance for this width. The customary rule-of-thumb allowance (kerf width equals twice the orifice diameter) is too crude for this class of work, yet it is not practical to present data on kerf widths because they vary appreciably with pressure, speed, tip size and distance between tip and plate. Kerf widths are specific to the particular cutting conditions involved, and should be ascertained by direct observation for each job. Once established, these conditions should be adhered to, because any charge which affects kerf width will cause a different final dimension to be obtained. Control also requires that the tips be kept clean and free from irregularities which will deflect the oxygen stream.

Longitudinal precision—comprehending straightness of cut, parallelism of opposite cuts, adherence to dimensions, and trueness of contour—depends upon a number of factors, of which the precision built into the cutting machine and the control of plate motion are dominant. The guide rails of the machine must be true, the operating mechanism should have minimum clearances, the propelling unit should have constant speed, and the tracing device accurate. Any construction of machine which introduces irregularities of motion or permits excessive wear of parts can be expected to produce inaccurate results.

TABLE III

Precision Cross-Cut Tolerances

Thickness, Inches	Squareness Tolerance
	±
1	0.0030
2	0.0100
4	0.0175
6	0.0312 (1/32)
12	0.0625 (1/16)
24	0.1250 (1/8)

Precision shape cutting demands that attention be given to the factor of thermal expansion due to heat of cutting. The introduction of heat to one side or portion of a piece of steel, such as occurs in cutting, naturally causes differential expansion of a temporary nature. This expansion in turn causes a slight snaking or "walking" motion of the plate. Unless controlled, it can produce inaccuracies which will be particularly noticeable on large flamecut pieces. There are several methods of control, one or more of which will be effective on any given job.

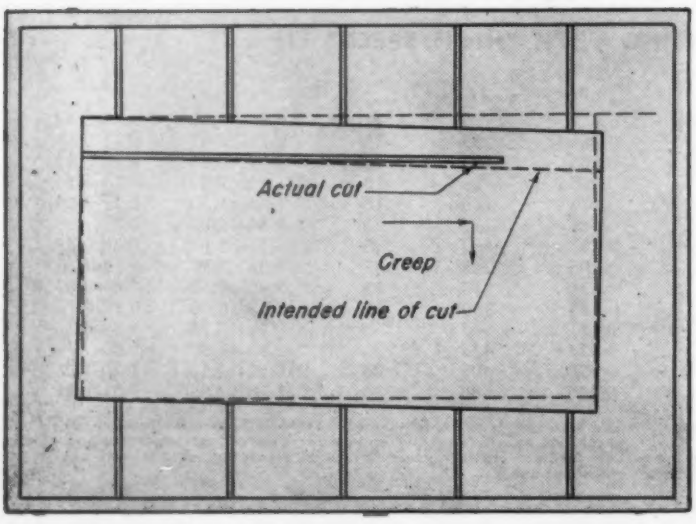
In the case of alloy steels which should be preheated throughout before cutting, the amount of expansion and contraction, and the resulting localized stresses, are materially reduced, depending upon the preheat temperature. Preheating can be utilized for this purpose on any grade of steel if desired. However, an allowance must be made for the normal cubical contraction which will occur when the finished item cools to room temperature.

A detailed analysis of plate motion has brought out the fact that the cut may be affected by either of two reactions in the plate to local expansion. The first is the snaking of the plate in itself. The second is the bodily movement of the snaking plate when one side rests against a rigid fulcrum point. If the plate tends to move and is stopped by some projection, a slag bond, or excessive friction, a rotative effect will occur.

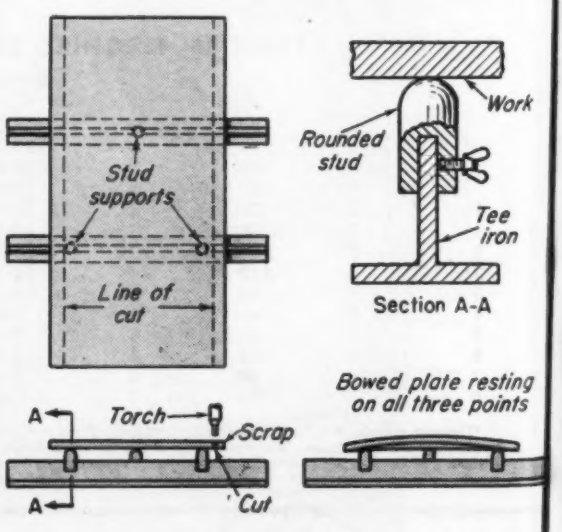
Plates Require Supports

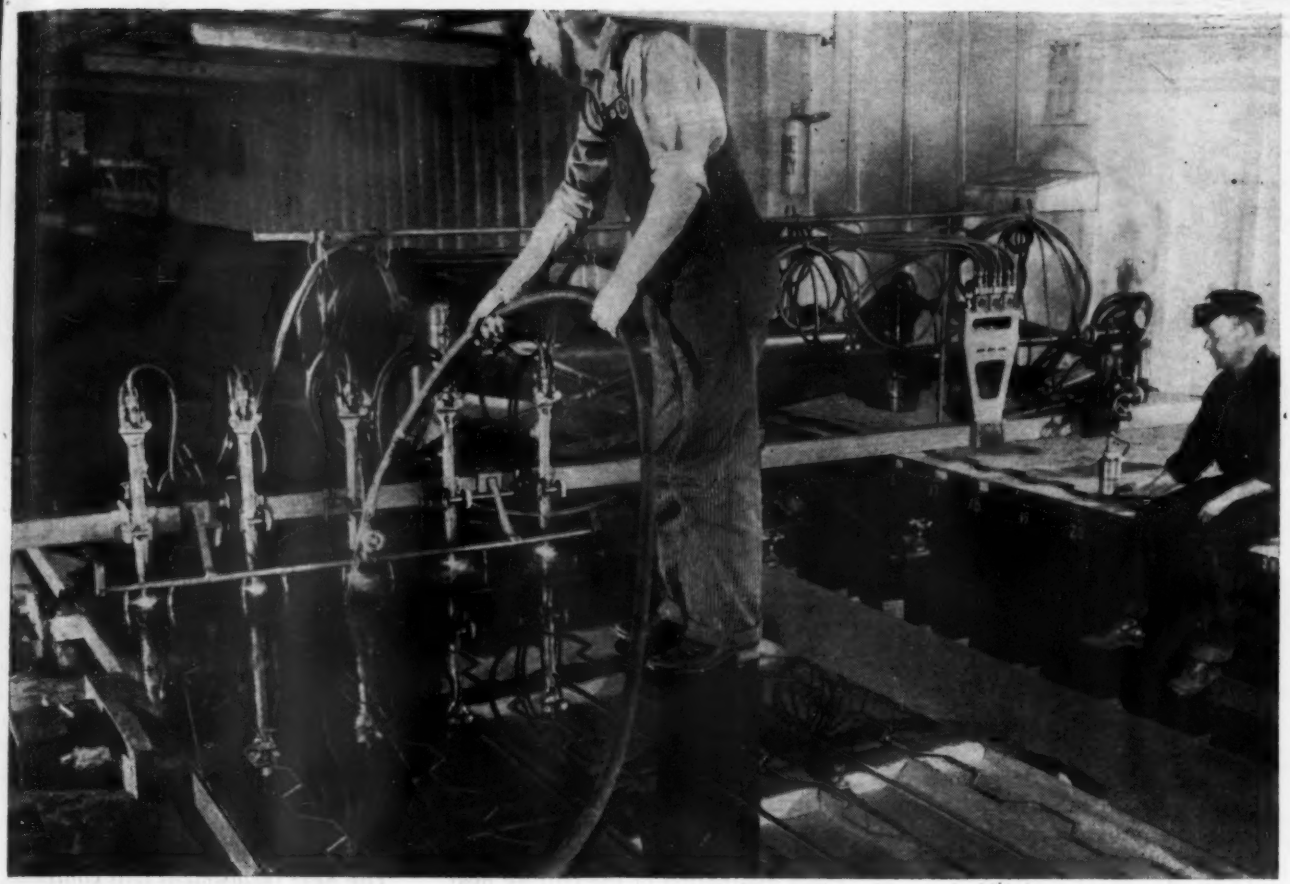
It is apparent that if the plate is mounted in a manner which permits freedom of motion, the tendency for errors will be minimized. The ideal method would be to secure the plate firmly at a single point in the center. However, this method is usually impractical, and at least three points of support must be provided, the exact number depending upon the

Exaggerated illustration of the rotative creeping of a plate which is restrained from normal motion by some projection or slag bond acting as a fulcrum point at upper left. Such rotation can occur around any point where movement of expansion is prevented. It is avoided by mounting the plate on point supports which are away from the direct line of cut

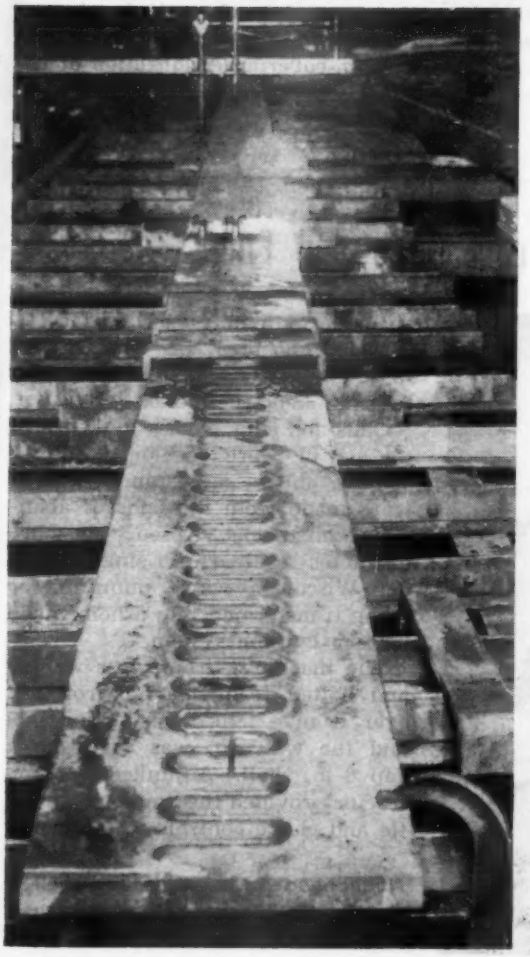


Method of supporting plate to permit freedom of motion, showing use of three supporting points located inside the cuts. Additional studs would be required on involved shapes, but frictional resistance should be held to minimum. Additional points might also be required to support scrap





Water quenching reduces distortion in cutting structural sections. Here five inverted channels are split along a serrated line by a Travograph. They are wedged tightly together to control lateral expansion, but are free to expand longitudinally. Low-pressure water jets issue from horizontal pipe following the torches, with a stream playing on each side of each cut. A hose supplements this quenching. The water does not interfere with cutting action. One-inch ligaments are left uncut at each end of channels until completely cooled, and are later severed with a hand torch

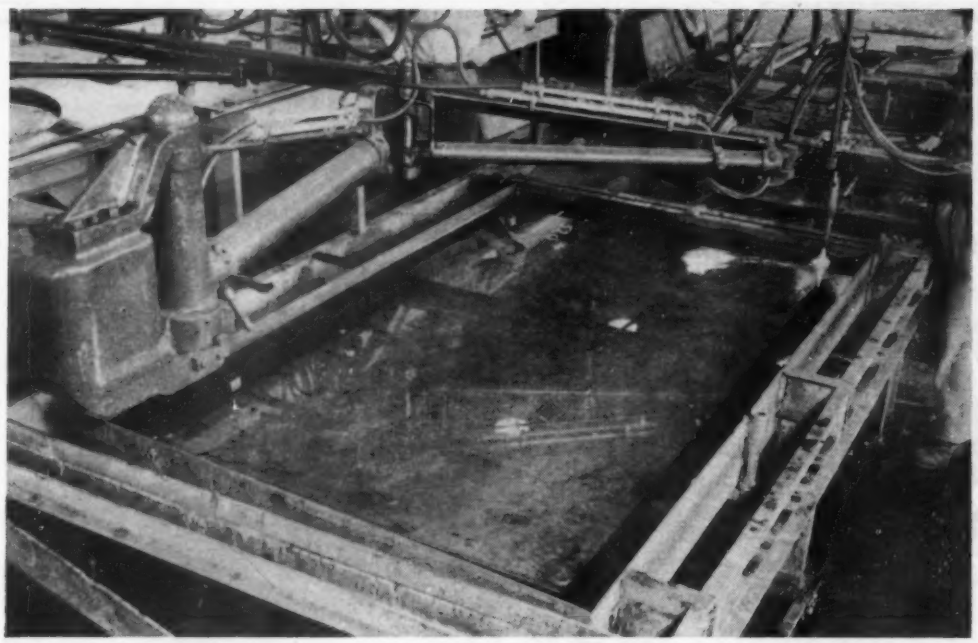


Distortion in cutting this bridge expansion joint, 44 ft. long, 15½ in. wide and 1½ in. thick, was controlled by several methods. Foreground end was left uncut; ¼-in. pins were inserted in kerf every 4 in.; strongbacks prevented outward lateral expansion; water-soaked cloths were placed on the steel directly behind the advancing cut to reduce warping. A special tip cut a ¼-in. kerf, needed for clearance. Despite this excessive heat input distortion was only 4 in. in 44 feet

size and shape of the workpiece. Rounded stud supports, described in an earlier installment of this series, are recommended since they offer a minimum of resistance to plate motion, permitting local expansion and eliminating any rotative tendency. Careful observations of production work have shown this to be true, and the repetitive results secured indicated control. Adjustments or allowance can then be made on the templet to reduce or eliminate errors resulting from snaking.

Other Mounting Methods

While the general problem of mounting the plate has been shown to be an important factor in controlling plate motion, other methods can be used. Some of these have as their purpose the reduction of expansion, others the compensation or



Cutting of thin plate under water has been found quite effective in preventing warping and reducing creep. This 1/2 in. plate is under 1/4 in. of water in a tank. Torch is suspended above water but preheat flames and oxygen jet penetrates easily. Starting is slower and cutting speed slightly reduced. Principal benefit is control of warp, not creep, and therefore the method has much less value in cutting plates 1 in. and up, which rarely warp

equalizing of expansion, and still others endeavor to avoid the problem entirely.

Water quenching is sometimes used to take up the heat of cutting during the progress of the cut. It is helpful when making longitudinal cuts on structural sections.

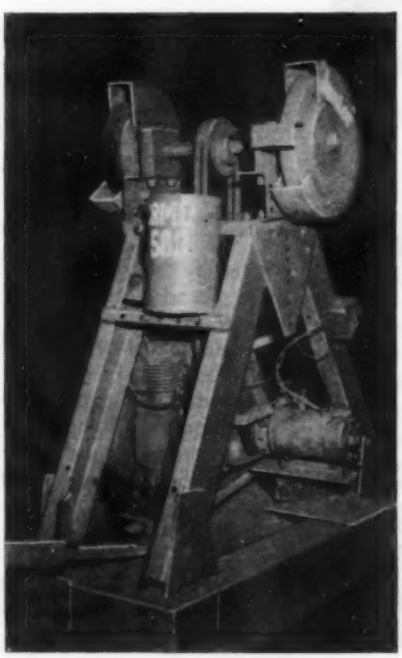
Thin plate which is likely to warp vertically as well as creep longitudinally has been successfully cut by immersing the entire plate in a water tank during cutting. The top surface of the plate is maintained level, about ¼ in. below the surface of the water, and cutting is done in the usual way with minor changes in pressure and reduction of speed to compensate for the back pressure set up by the water. Due to the rapid dissipation of the cutting heat, warpage is reduced to a virtually negligible degree, and greater accuracy and closer tolerances are achieved. The severe quenching might be expected to cause a considerable rise in hardness of the cut surface, but studies of plate cutting showed the hardness to be only slightly more than that of material cut in open air, with one-third less penetration.

The next installment will continue the discussion of methods of controlling thermal expansion in flame cutting, covering equalization of expansion, skip-cutting, scrap control, and clamping.

Seabees Build Grinding Machine From Odds and Ends

THE MECHANICAL ingenuity of our fighting men has been demonstrated repeatedly in far distant battle sections of the world. A typical example of their skill is represented in the construction of a grinding and scratch wheel machine from salvaged items ranging from a Jap shell to a broken truck axle. The machine was built overseas in their spare time by Machinist's Mate First Class Herman Voss and Machinist's Mate Second Class Louis Stewart, U.S.N.R., attached to a Navy Seabee Maintenance Unit.

Nicknamed "Junior" by its originators, the machine has a 23 x 1½ in. spindle press fit into 12 in. ball bearings which ride in 5 in. square steel pillow blocks and are sealed in grease. The spindle has right and left hand threads turned down to 1-in. diameter and is geared down to 1,575 r.p.m. at top motor speed to give approximately 5,000 surface ft. per min. using 12-in. wheels. The spindle was turned from a broken International truck axle.



Odds and ends from a junked motor patrol were fashioned into a spindle pulley, and spindle guards were made from the ends of abandoned oil drums. Absence of spare magnetos resulted in a single-cylinder Wisconsin water pump motor being transformed into a homemade battery ignition system.

The machine's frame was welded and bolted from channel iron left over from a tank construction job, and the waterpot was cut from a Jap 6-in. shell. A junked Fordson tractor provided the ammeter, throttle and choke controls.

Abandoned parts and a Jap shell went into this grinding and scratch wheel unit

RECONVERSION SECTION

Detroit Turns From War Production To Plant Clearance Problems

Faced with sudden termination of war contracts, Ampco devised short cuts and simplified forms to speed plant clearance and arrange for complete reconversion to commercial items. The company's clearance procedure is reviewed because it reflects the many involved problems confronting similar subcontractors

MORE THAN 800 prime contracts in the Detroit Region, ATSC, have been terminated by the Army Air Forces since V-J Day. These do not include the hundreds of other contracts which the Navy, Army Ordnance, Engineers, Signal Corps and other divisions of our war machine have suddenly cut-off. It is probably conservative to say that for every prime contract there are an average of a hundred subcontracts. In other words, there must be 70,000 to 100,000 subcontracts to be handled in this district alone.

This enormous group can be divided immediately into those contracts under $10,000, and those above. The smaller claims are all handled directly by the prime contractor, as authorized by the Joint Termination Regulation, but the larger ones, in the case of the AAF subcontracts, are prepared with the assistance of the AAF staff. This great group of subcontractors, many of whom have not had much to do with terminations, and practically nothing with "plant clearance" should find the following review of American Metal Products Company's experience and problems most helpful.

The company's termination came on April 20, 1945, and by June 6, the DPC machines had been cleared from the plant. On June 15 Ampco had completed taking Termination Inventory and finished the paper work. The Termination Claim then went through the prime contractor the the AAF, being received June 29, but required correction and was not returned to AAF in corrected form until July 11, when the official Termination Clearance period began.

Termination Came Suddenly

How they did it, the short cuts and simplifications they worked out, were explained by L. B. Hyde, termination supervisor, and A. M. Mras, comptroller for American Metal Products Company. In normal times the firm employs about 800 men. Their subcontracts were with the Ford Motor Company on B-24 Bomber parts. At the time of termination 53 items were in process, but all work stopped immediately. The termination notice came so suddenly that no pretermination paper work had been done, a situation confronting many subcontractors today. Actual clearance procedure cannot be established until the termination takes place.

There are two steps after termination:

1. Plant Clearance
   (a) DPC machine tools and equipment
   (b) Termination material inventory, including work in process.
2. Filing and settling the financial claim.

To get business going again and men back to work, the first step is to clear the plant for reconversion. This sounds simple, but it will require a lot of patience and hearty cooperation with the various officers and inspectors who have to participate in the clearance.

Government forms and procedure are prescribed for all this work by Office of Contract Settlement, but they are not well suited for use in the shop as Mr. Hyde explained. He found that it greatly expedited the job if work forms which they had "Dittoed" on white sheets were used by special termination group workers. These sheets came back with the proper information to be transcribed on the official Termination Schedule sheets. These sheets carried complete count, weight, costs, calculations, remarks, and "finger prints" for each part number. This made it easy for a clerk to arrange the information in proper sequence and transcribe it on the official forms later. It also provided an easy thing to audit in case the prime contractor or government officials questioned any item.

Ampco elected to clear its shop first of DPC machine tools, and dies, jigs, fixtures, and similar items. This provided floor space for setting up postwar production lines. Such procedure should clear 80 to 90

percent of floor area in most plants. At the time Ampco started plant clearance, there were over 300 DPC machine tools in the shop and hundreds of thousands of material inventory parts. Insufficient manpower made it impossible to clear the machines and take a physical inventory at the same time.

The dies, jigs and fixtures, in this case, had been consigned to "Ampco" and as they became scrap after V-J Day, were independently disposed of by authority of the government. To save unnecessary government handling and expense they were scrapped right at the "Ampco" plant. Termination form "2d" would ordinarily have been used by a subcontractor in submitting this kind of a claim.

The machine tools, however, were all furnished by DPC with AAF sponsorship. At the time this contract was terminated, before V-J Day, it was necessary to make up detailed specifications of each tool on a separate sheet, and submit these to Wright Field for screening as to their usefulness at some other defense facility. If AAF had no use for them, then they were submitted to the Engineering Department of DPC at Washington for instructions as to their disposal. Since V-J Day this step is shortened since all

TERMINATION INVENTORY SCHEDULE—METALS (IN MILL PRODUCT FORM) — FORM 2A, OFFICE OF CONTRACT SETTLEMENT
(USE FORM 2B FOR CASTINGS AND FORGINGS)

THIS SCHEDULE APPLIES TO (CHECK ONE):
☐ A PRIME CONTRACT WITH THE GOVT., OR ☒ SUBCONTRACT(S) OR PURCHASE ORDER(S) WITH FORD MOTOR COMPANY
(NAME OF CONTRACTOR WHO SENT NOTICE OF TERMINATION)
3000 SCHAEFER ROAD, DEARBORN, MICHIGAN
FOR (ADDRESS) B 24 Bomber Parts
(PRODUCT COVERED BY TERMINATED CONTRACT OR ORDER)

PROPERTY CLASSIFICATION (SEE INSTRUCTIONS) 22 Chrome Moly Steel Tubing
American Metal Prod. Co.
5959 Linsdale Ave.,
Detroit 4, Michigan
(COMPANY) (STREET ADDRESS) (CITY) (STATE)

PRIME CONT. NO. W 535 AC 21216 CONTRACTOR'S REF. NO. AMP 27 LOCATION OF MATERIAL At Plant

2a

LEAVE BLANK	ITEM NO.	DESCRIPTION			DIMENSIONS: THICKNESS	DIMENSIONS: WIDTH	DIMENSIONS: LENGTH FT.	DIMENSIONS: LENGTH IN.	CONDITION (SEE INSTRUCTIONS)	QUANTITY	UNIT OF MEASURE	COST: UNIT	COST: TOTAL	✓ IF ITEM IS ENTERED	CONTRACTOR'S OFFER (C), OR PROCEEDS OF AUTHORIZED SALE (A)*	LEAVE BLANK
	(1)	(2A)	(2B)	(2C)	(3A)	(3B)	(3F)		(3)	(4)	(4A)	(5)	(6)	(7)	(8)	
	1	Tubing In Str Lengths	Annealed	NE 8630	.072	1 1/8"	8' to 18'		N1	1426	Ft.	.2856	407.27	S		
	2	" "	"	"	.072	1 3/4"	6' to 18'		"	1706	"	.40035	683.00	S		
													416.21	S		

TERMINATION INVENTORY SCHEDULE — FORM 2B, OFFICE OF CONTRACT SETTLEMENT

☐ RAW MATERIALS (OTHER THAN METALS) ☐ PURCHASED PARTS ☐ FINISHED COMPONENTS ☐ FINISHED PRODUCT ☐ MISCELLANEOUS

THIS SCHEDULE APPLIES TO (CHECK ONE):
☐ A PRIME CONTRACT WITH THE GOVT., OR ☒ SUBCONTRACT(S) OR PURCHASE ORDER(S) WITH FORD MOTOR COMPANY
(NAME OF CONTRACTOR WHO SENT NOTICE OF TERMINATION)
3000 SCHAEFER ROAD, DEARBORN, MICHIGAN
FOR (ADDRESS) B 24 Bomber Parts
(PRODUCT COVERED BY TERMINATED CONTRACT OR ORDER)

PROPERTY CLASSIFICATION (SEE INSTRUCTIONS) 33CC 31 Roller Bearings
American Metal Prod. Co.
5959 Linsdale Ave..
Detroit 4, Michigan
(COMPANY) (STREET ADDRESS) (CITY) (STATE)

PRIME CONT. NO. W 535 AC 21216 CONTRACTOR'S REF. NO. AMP 27 LOCATION OF MATERIAL At Plant

2b

LEAVE BLANK	ITEM NO.	DESCRIPTION	GOVT. PART OF DRAWING NO. AND REF. NO.	OTHER PIECES (SIZE, GRADE, CONTROL CYL.)	CONDITION (SEE INSTRUCTIONS)	QUANTITY	UNIT OF MEASURE	COST: UNIT	COST: TOTAL	✓ IF ITEM IS ENTERED	CONTRACTOR'S OFFER (C), OR PROCEEDS OF AUTHORIZED SALE (A)*	LEAVE BLANK
	(1)	(2)	(2A)	(2B)	(3)	(4)	(4A)	(5)	(6)	(7)	(8)	
	1	R.B.C. 8 Roller bearings		Bulk	N1	2432	Ea.	1.00	2432.00	S		

TERMINATION INVENTORY SCHEDULE—WORK IN PROCESS — FORM 2C, OFFICE OF CONTRACT SETTLEMENT

THIS SCHEDULE APPLIES TO (CHECK ONE):
☐ A PRIME CONTRACT WITH THE GOVT., OR ☒ SUBCONTRACT(S) OR PURCHASE ORDER(S) WITH Ford Motor Company
(NAME OF CONTRACTOR WHO SENT NOTICE OF TERMINATION) 3000 Schaefer Rd. Dearborn, Michigan
FOR (ADDRESS) B24 Bomber Parts
(PRODUCT COVERED BY TERMINATED CONTRACT OR ORDER)

American Metal Products Company
(COMPANY) 5959 Linsdale
(STREET ADDRESS) Detroit 4 Michigan
(CITY) (STATE)

PRIME CONT. NO. W535 AC21216 CONTRACTOR'S REF. NO. AMP 27 LOCATION OF MATERIAL At Plant

2c

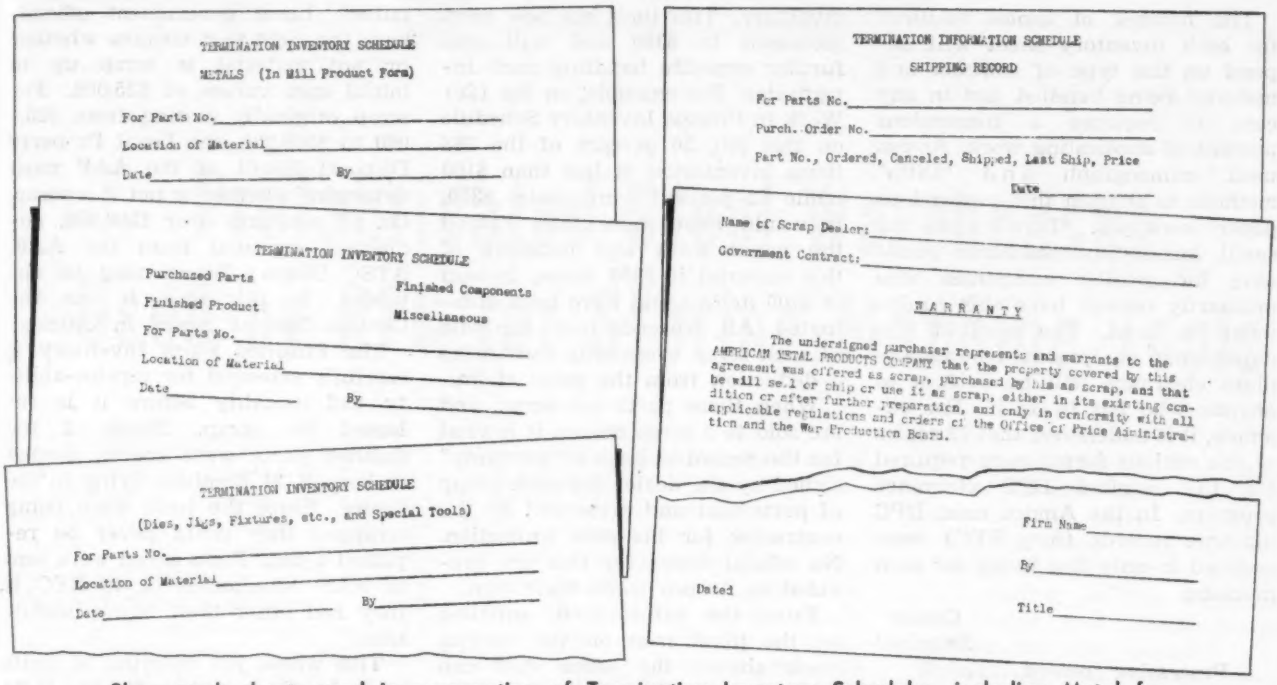
LEAVE BLANK	ITEM NO.	DESCRIPTION	ESTIMATED WEIGHT	QUANTITY	UNIT OF MEASURE	COST: UNIT	COST: TOTAL	✓ IF ITEM IS ENTERED	CONTRACTOR'S OFFER (C), OR PROCEEDS OF AUTHORIZED SALE (A)*	LEAVE BLANK
	(1)	(2)	(2A)	(3)	(4)	(5)	(6)	(7)	(8)	
		PART NO. GK32L 10220-C Last Oper. Comp.								
	162	GK32L10220-0 Tubular Ass'y. Cad Plated		50	ea.	5.79	289.50	S		
	163	" -6 Tubing Finished		41	ea.	.39	15.99	S		
	170	GK32L 441-0 Tubular Ass'y. Finished less Bearings		240	ea.	89.89	21573.60	S		
	171	GK32L 441-0 " " Fin.Mach.		319	ea.	79.04	25213.76	S		
	172	GK32L 441-0 " " Rockwell		177	ea.	50.39	8919.03	S		

*USE COL. 8 FOR CONTRACTOR'S OFFER AND FOR PROCEEDS OF AN AUTHORIZED SALE. INDICATE FORMER BY "C" AND LATTER BY "A" AFTER DOLLAR AMOUNT. SHOW QUANTITY (ON A SECOND LINE) IF LESS THAN COL. 4.

PAGE 26 OF 34 PAGES.

NOTE.—SEE INSTRUCTIONS, PAR. 25, CONCERNING CERTIFICATE. SEE INSTRUCTIONS, PAR. 26, CONCERNING GOVT. OWNED PROPERTY.

Typical Form 2a made out in this case for tubing. There were nine pages under this schedule. Typical Form 2b showing the sheet on roller bearings. There were 20 pages in this schedule, each sheet devoted to one property classification, and also arranged according to raw material, purchased parts, finished components, finished product, or miscellaneous. Under the latter were 528,000 toothpicks. Work in Process, Form 2c, is an example of how important it is to arrange the information properly and thus avoid difficulties later on



TERMINATION INVENTORY SCHEDULE

METALS (In Mill Product Form)

For Parts No._____

Location of Material_____

Date_____ By_____

TERMINATION INVENTORY SCHEDULE

Purchased Parts — Finished Components

Finished Product — Miscellaneous

For Parts No._____

Location of Material_____

Date_____ By_____

TERMINATION INVENTORY SCHEDULE

(Dies, Jigs, Fixtures, etc., and Special Tools)

For Parts No._____

Location of Material_____

Date_____ By_____

TERMINATION INFORMATION SCHEDULE

SHIPPING RECORD

For Parts No._____

Purch. Order No._____

Part No., Ordered, Canceled, Shipped, Last Ship, Price

Date_____

Name of Scrap Dealer:_____

Government Contract:_____

WARRANTY

The undersigned purchaser represents and warrants to the AMERICAN METAL PRODUCTS COMPANY that the property covered by this agreement was offered as scrap, purchased by him as scrap, and that he will sell or ship or use it as scrap, either in its existing condition or after further preparation, and only in conformity with all applicable regulations and orders of the Office of Price Administration and the War Production Board.

Firm Name_____

By_____

Dated

Title_____

Shop work sheets used in preparation of Termination Inventory Schedules, including Metal for 2a data; for 2b data; data for dies, etc.; shipping data for finished parts, machines and tools; Scrap Warranty Form necessary when making out final claims

standard machines are now taken over by the RFC Surplus Property Division, and directives given as to how they are to be prepared and shipped. However, special tooling that has no future use is usually recommended for scrapping.

It is important to get instructions from the RFC regarding the processing for storage of government DPC machine tools. RFC may not want them processed, especially if they are to be trucked to some other facility. On the other hand, if the machines are to be processed, the contractor should have a complete operation check sheet made and initialed by the RFC inspector before the machine is removed. Otherwise, the contractor may not be able to substantiate a claim for the labor and material used, although entitled to it. Skids and crating are also specified and must be approved by an authorized RFC representative if the contractor expects to be paid for this work in his plant clearance program.

Every plant with a DPC "Plancor" divides machine tools into two categories: those to be kept and those to be returned to the government. Usually DPC machines can be purchased on a scheduled depreciation basis, "Clayton Formula," which was designed to prevent "windfalls," as the Senate called them, accruing to the lessees of such government equipment.

In the Detroit district of the RFC everything possible is being done to prepare for rapid plant clearance. Already 350 acres are either under lease, or in process of being leased. 233 acres are already prepared for the storage of machinery, cutting tools, and raw material. Nine warehouse sites are already in operation with a million sq. ft. in T.O. Warehouses, and 2,750,000 sq. ft. more prepared for prefabricated Stran-Steel shelters which are erected over the machinery as soon as it is set in place.

Cutting tools are handled by RFC just like the machine tools and removed to warehouses in the same manner as soon as they can be checked and a physical inventory made by the RFC.

Inventories Must Be Accurate

With the tools out of one's plant, it is possible to start arranging the shop for postwar production and getting men back to work in the shortest possible time. At least, it has proved so in this case.

Handling the big tools, however, is the least of the problems encountered in plant clearance. Getting an inventory of the material on hand is the tough job. It requires the compilation of much detailed work and unquestioned accuracy in its preparation. If errors are made their correction before the complete inventory can be accepted and cleared may delay termination plant clearance weeks, and require duplicating a large part of the paper work.

Physical Termination inventory falls into four general classes:

- 2a. Metals (in mill product form)
- 2b. Inventory (purchased, finished, and miscellaneous parts)
- 2c. Work in process
- 2d. Dies, jigs, fixtures, etc.

The prefix given above is that used by the Office of Contract Settlement for each particular class of material. Sample pages of the first three classes are shown as they were prepared for this case. The material was of such a nature that the extensions in column (8) (the Contractors offer for the items) were not made and instead the consolidated amount was shown on the last and total sheet in each inventory group. This is time saving and may be permitted by the auditors on another job as in this case.

One of the best ways suggested to expedite the termination plant clearance is to concentrate on 2d and 2c inventories in that order and present these as soon as complete. Then follow with 2a and 2b as they are finished. This is the so-called "partial inventory method" of plant clearance recommended by JTR. If there are any questions about this time-saving method, the AAF staff are anxious to assist in every way possible.

The number of copies required for each inventory sheet will depend on the type of contract and material being handled, but in any case it requires a tremendous amount of duplicating work. Ampco used mimeograph and "Ditto" methods to shorten this tremendous paper work job. "Ditto" even has small loaner-type machines available for smaller companies who ordinarily do not have this equipment on hand. The need of this duplicating equipment to expedite plant clearance will be evident to anyone who has to do it. For example, it is understood that 72 copies of the various forms were required for the original DPC clearance program. In the Ampco case, DPC machine records (now RFC) were reduced to only five forms for each machine.

	Copies Required
Processing record.....	3
Inspection certificate..	3
Equipment check sheet.	4
Packing list.....	7
Memo of transfer.....	13

The first form is a special one, of which only three copies are required. The remainder are enough alike so that all of them can be "Dittoed" at one time, if the master sheet is made out properly.

The parts which are not essential are blanked out by XXX marked lines on the particular printed sheet. By this simple arrangement 27 copies can be run from one master stencil on four different forms. This saves much time.

To expedite the preparation of the termination inventory, five simple shop work sheets were prepared by Ampco. They were not official looking. They were just convenient memos on which the special termination group workers could make the shop record. When collected, they provided the basis for filling out the official "Termination Inventory Schedules" required by the government. Being on individual sheets they could be prepared according to part numbers ahead of time, then collected as rapidly as inventory checks had been made, and arranged in correct grouping, for inclusion in Termination Claim Schedules.

Hours of time can be saved in making up these lengthy inventory sheets and duplicating them by "Partial Plant Disposal" permission. Until September 1, 1945, a contractor could dispose of items which cost less than $100, and then make a claim for the difference in his inventory. This limit has now been increased to $300 and will still further expedite handling such inventories. For example, on the (2c) Work in Process Inventory Schedule on this job, 36 percent of the 263 items inventoried at less than $100 while 62 percent were under $300. It would have more than halved the paper work and handling of this material if $300 items, instead of $100 items could have been eliminated. All proceeds from the sale of such scrap eventually constitutes a deduction from the gross claim.

When these parts are scrap, and are sold to a scrap dealer, it is vital for the record to have a "warranty" signed by the dealer for each group of parts sold and preserved by the contractor for his own protection. No official forms for this are provided so Ampco made their own.

From the information, supplied by the plant men on the various work sheets, the office staff can make the stencils to print the many Termination Inventory Schedule sheets required.

After termination inventories have been screened by the government for their future usefulness the rejected parts are to be scrapped. Sealed bids must be obtained. Local government officials have the right to determine whether or not material is scrap up to initial cost values of $25,000. For scrap originally costing from $25,000 to $500,000, the Local Property Disposal Board of the AAF must determine whether or not it is scrap. On all amounts over $500,000, additional approval from the AAF, ATSC District Board must be obtained. In this case, it was the Central District Board in Chicago.

The Finished Parts Inventory is carefully screened for service-ability and usability before it is released for scrap. Many of the finished parts were spares needed to keep B-24 Bombers flying in the future. Since the tools were being scrapped they could never be replaced again. Parts saved were sent to AAF warehouses or to RFC if they had other than Army usefulness.

This whole job covering 53 units made by the company for the B-24 had taken about 120 days from termination notice to cleared plant. While this may seem long, one must remember that the government clearance time only starts with the presentation of an inventory that is complete and acceptable.

D-1

DEFENSE PLANT CORPORATION
PLANT CLEARANCE PROGRAM

LESSEE American Metal Products Company PLANCOR NO. 1307
ADDRESS 5959 Lindale Avenue PLANT LOCATION Detroit
MACH. NO. DPC-512 PURCH. ORDER NO. MA-512 D.P.C. CERT. NO. 4
MACHINE NAME #3-A Warner & Swasey Turret Lathe
MANUFACTURER Warner & Swasey SERIAL NO. 586140-W

QUAN.	D.P.C. INV-NO.	DESCRIPTION	COST PRICE F.O.B. MFGR.
1	MA-512	#3-A Warner & Swasey Turret Lathe	$ 9385.50
1	MA-512-B	M-1959 6" Bar Chuck	900.00

FREIGHT $ 31.76 TOTAL INSTALLATION $ 111.16 COST F.O.B. MANUFACTURER'S PLANT $ 10966.71
FREIGHT CERT. NO. 4 TOTAL COST $ 11148.91
PROGRAM UNDER WHICH PAID (CONSTRUCTION OR ACQUISITION) Acquisition
DATE OF INITIAL USE IN PLANT OF LESSEE FIRST USING EQUIPMENT 7-4-42

MISSING ITEMS, IF ANY, ARE LISTED ON FORM D-4
CONDITION OF THIS EQUIPMENT IS Good

It is hereby certified that the items listed on this certificate were last inspected by J. M. Bayley (Name) representing AMERICAN METAL PRODUCTS CO. (Lessee Company) and that said items complete as described, and with all attachments, parts, etc., listed on the Asset Property Records or in the Purchase Orders have been found except as listed herein as missing, and that such items are in operating condition as shown above and that said Company has used reasonable care in the use and operation of said items and has fulfilled its obligations under its lease agreement with D.P.C. with respect to maintenance, and that D.P.C. property tags or numbers have been permanently affixed thereto. This certification is for the sole benefit of Defense Plant Corporation and is not to be extended to, and does not constitute a representation or warranty to prospective purchasers or others.

(Strike out whichever is not applicable)

(Date) By (Lessee's Designated Representative) (Title)

The equipment described above has been prepared for removal from Lessee's plant and for storage in accordance with outstanding instructions.

(Date) By (Lessee's or Contractor's Designated Representative) (Title)

Lessee is hereby relieved of further responsibility or accountability of above items (except for missing items marked (M) and initialed) effective upon shipment thereof.

(D.P.C. Supervising Engineer)

D-3 INSPECTION CERTIFICATE

Typical standard form used in clearing DPC machine tools from the industrial plant

Prefabricated Steel Warehouses Used by RFC for Storing Machine Tools

THE AUTOMOTIVE industry can use about 15 percent of the war equipment it possessed at the end of hostilities, according to a survey made by the Automotive Council for War Production. The remaining 60,000 to 100,000 machine tools will have to be removed and stored by the Reconstruction Finance Corporation to clear plants for reconversion.

The Defense Plant Corporation spent $808,000,000 in the Detroit area alone for war production. Of that amount, $500,000,000 represents machine tools and equipment.

Arthur J. Cushman, manager of the RFC office in Detroit, reports that $30,000,000 worth of machine tools and equipment are already stored in three storage areas. These three areas represent only a small portion of the 233 acres now available, including 1,000,000 sq. ft. of Army Theater of Operations warehouses and 2,750,000 sq. ft. of Stran-Steel prefabricated shelters which are set up as fast as the equipment is spotted. An additional 1,580,000 sq. ft. of open space has been laid out for prefabricated storage structures as they are needed.

All machine tools are processed according to regulations PS 103-4 at the contractor's plant before they are removed for storage. This protective processing is so thorough that officials contend the machines will be in just as good condition five years hence as they are now—if they remain unsold for that long.

The RFC plans erection of showrooms and offices at each of the three large storage areas as part of its program of selling the material as soon as possible. Samples of stock available in each yard will be on display and specifications and the location of each machine will be on hand at each office. The equipment is being cross-indexed as to lot and type so that it can be inspected and selected by buyers without delays.

In the Detroit metropolitan area there are seven RFC storage depots arranged so that the haul from cleared plants to storage will be short. Three of the depots have a total acreage of 303. One is in Highland Park and comprises 68 acres, the second in Ecorse with 76 acres, and the third at River Rouge with 93 acres developed and 66 in preparation.

At Russell and Ferry Streets, 523,000 sq. ft. are covered for storing mill run stock bars, tubes and similar standard materials. This is carefully classified and segregated, even according to heat-treatment where known. Cutting tools are stored in heated buildings at 237 Vinewood and 306 Bates. There are 50,000 sq. ft. of storage space at the Ford River Rouge plant, an aluminum scrap warehouse at Marysville, Mich., and a 50,000 sq. ft. warehouse at the AC Spark Plug Company at Flint, Mich.

Mr. Cushman explained that the RFC is anxious to sell the tools and equipment on hand as fast as possible. Most of the sales are made under the Clayton formula which depreciates them on a monthly basis arriving at about 45 percent after 36 months of use. Price is FOB cars or truck at storage location.

An ingenious warehousing scheme has been developed. Box storage is available in "T-O" Army warehouses which are built of wood and composition sheating, and have cement floors. Machine tools, however, are placed on 12 x 12 timbers to keep the skids off the ground and facilitate handling. The timbers are on level ground which is well drained at all the locations chosen. Walter A. Wilson, chief of the RFC Storage Division, said the method of warehousing the machine tools in prefabricated steel buildings was originated by Col. Richard Walker, ASF Storage Division. The buildings are all-steel with corrugated steel roof and sides. Ventilation beneath the sides, under the eaves, and in the ends is intended to eliminate sweating of the equipment stored inside, and affords weather protection the year around.

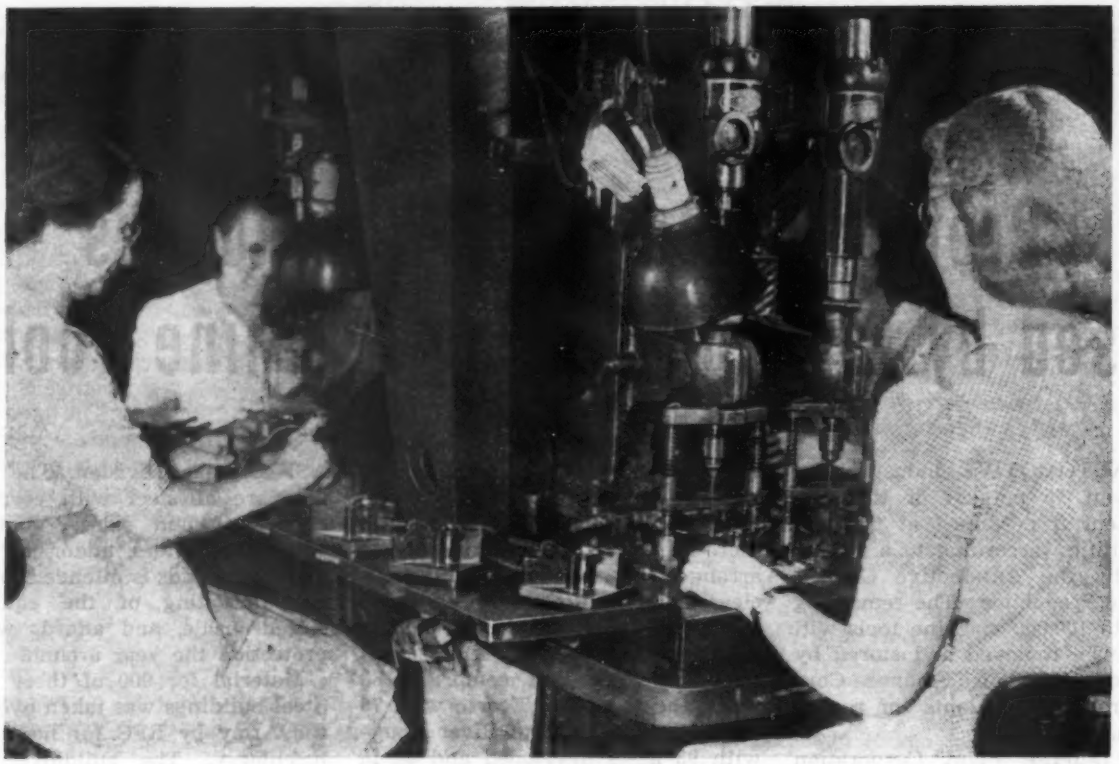
Material for 900 of these Stran-Steel buildings was taken over from the Army by RFC for housing the machinery. The buildings, 20 ft. wide and 100 or 200 ft. long, are fastened to cement piers at each upright, which are set at 10-ft. intervals. A rectangular frame is diagonally braced and secured to the uprights on either side by six bolts. This is covered with corrugated steel siding.

Any machine can be removed from the building by taking out two lower bolts on each side of the frame and loosening the two upper bolts. Then the whole side swings up out of the way, pivoting on the upper bolts as a hinge. The machine can then be skidded out onto a truck and the side lowered and bolted in place again in rapid order. This construction costs RFC about 66 cents per sq. ft. erected, and will undoubtedly be of interest to all manufacturers who have outside storage problems.

To save time in removing machinery from the plants and storing it at the depots, the warehouse area is all laid out, leveled with bulldozers, and cement foundations put in spaced every 10 feet. This locates the 20 x 200 ft. buildings.

Army and Navy mobile crane equipment is available at every new site, and as fast as trucks haul machines to the area they are removed, swung into place within the building foundation lines, and covered temporarily with tarpaulins until the storage buildings are erected over the machines.

Operations now are on an eight-hour basis, but will be expanded.



Two Avey two-spindle sensitive drill presses placed back-to-back, and fitted with sheet steel benches connecting their worktables, form a drilling "merry-go-round" for assembling, drilling and riveting rotors and setback blocks for a percussion fuze. Twelve fixtures are used to eliminate waiting time

Drill Press "Merry-Go-Round" Coordinates Operations on Fuze Parts

BRASS ROTORS and setback blocks for a percussion fuze are assembled, drilled and riveted on a mass production basis in the Carter Carburetor Corporation's plant on a "merry-go-round" set-up which has made it possible to produce increasingly large quantities of these assemblies without undue operator fatigue. Basically, the machine unit consists of two Avey two-spindle sensitive drill presses placed back-to-back and fitted with sheet-steel shelves which connect the drill press tables at each end to form a square worktable surface extending around the two machines. Four operators work at this production unit.

The operations performed at each of the drill presses are identical. The first spindle, at the operator's left, is used to drill a 0.045 in. diameter hole through the two parts,

Two drill presses are set-up back-to-back for assembling, drilling and riveting of two parts in an efficient cycle

which are clamped in a special fixture. Next, the fixture is moved to the second spindle where a drill-rod punch held in the non-rotating spindle chuck is used to head a copper rivet which the operator inserts in the drilled hole as the fixture is being transferred from the first spindle to the second.

When the riveting operation has been completed, the drill press operator moves the fixture to her right along the bench surface to a loading station where the riveted assembly is removed from the fixture and a rotor and a setback block are inserted and clamped. The loading operator then moves the fixture along to her right to the second drill press operator at the other end of the machine unit. Thus, the drill press operator has only to place and remove loaded fixtures in the work stations under the drill press spindles, and feed the two spindles by hand. At each loading station are two chutes which deliver the parts to a convenient position for loading the fixtures. Assembled units are dropped into a third chute for delivery to tote pans on the floor between the two drill presses. To insure that there is no delay, there are twelve duplicate fixtures provided for these operations. Thus, each drill press operator always will find a loaded fixture ready for her at the

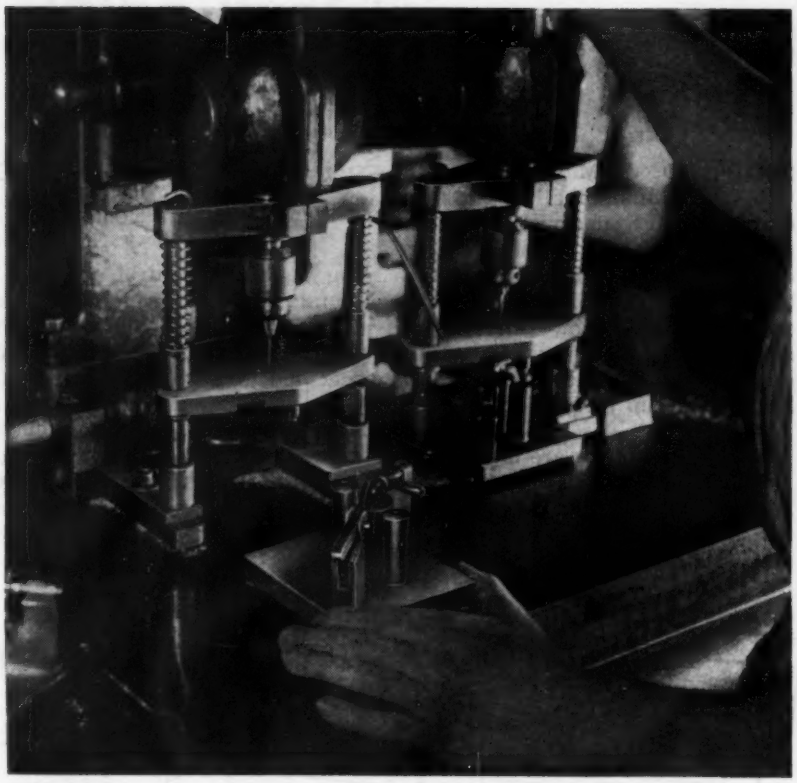
left-hand end of her worktable positioned ready for use at the drilling station.

As indicated in the accompanying illustrations, each fixture consists of a square steel baseplate carried on four drill rod feet. On each base is mounted a pedestal carrying nest plates in which the two parts can be assembled accurately. Inside the pedestal is an ejector slide which permits easy removal of the riveted assembly when the operation has been completed. Beside the pedestal on each fixture is a cam-operated locking arm, and a locator slide with a pin which fits into a previously drilled hole in the brass rotor part to insure accurate alignment of the two parts when assembled.

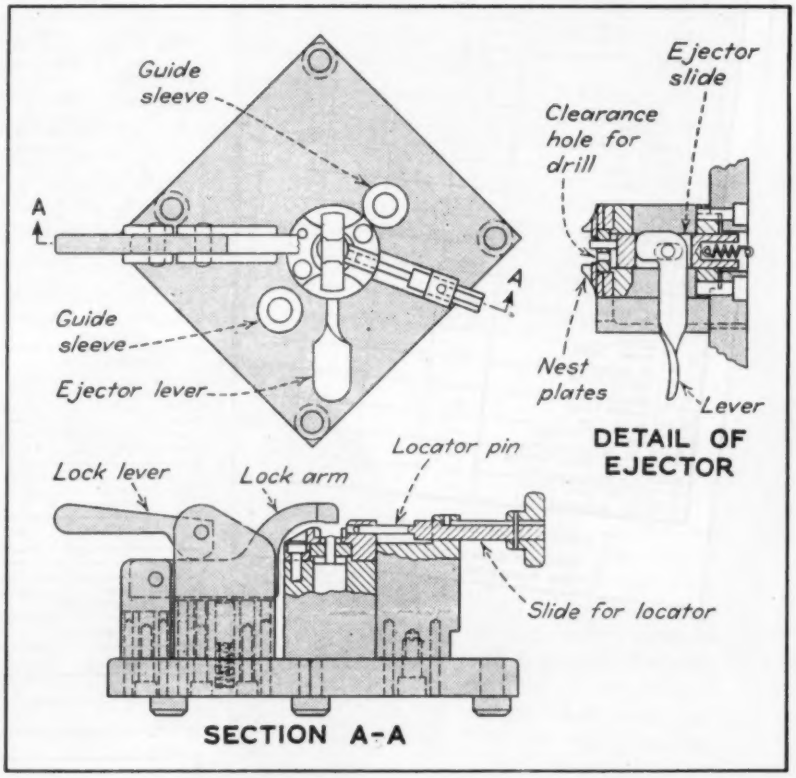
At each of the two drilling stations the drill spindle carries a spring-loaded bushing plate which slides on vertical guide arms mounted on rails bolted to the table of the drill press. The bushing plate has on its under surface two vertical pins which enter into guide sleeves mounted on each fixture base to locate the fixture accurately with relation to the drill before the drilling operation starts. Similar guide pins in the bushing plate carried by the second spindle locate the fixture for the riveting operation.

When the work cycle is operating normally, the drill press operator inserts a fixture under the drilling spindle with her left hand while she is moving the riveting spindle downward with her right hand. Then, her right hand is used to feed the drilling spindle to drill the hole in the new parts. Third, this operator uses both hands to shift the two fixtures, the one containing the riveted assembly being moved along the bench to the loading position while the fixture on her left is withdrawn from the drilling station and moved in front of the riveting station. Her right hand, while returning, selects a copper rivet from a box beside the riveting station. This rivet is inserted in the previously drilled hole and the fixture then is moved into the riveting station with her left hand while the right hand moves to grasp the feed lever for the riveting spindle. Then, she repeats the entire cycle.

The coordination of motion and time analysis with fixture design for this set-up has made possible a sequence of motions on the part of each of the four operators which give an efficient production cycle with little fatigue. Where drilling requirements justify the cost of the extra fixtures, this arrangement is suitable for many other drilling operations where it is necessary to drill one or two holes.



Accurate location of the work-holding fixture is insured by nesting it between guide rails on the drill press table, and then by using pins under the bushing slide which enter into guide sleeves on the fixture base before the drill enters the work. A similar arrangement is provided at the riveting station to center the riveting plunger over the rivet



The base of each of the work fixtures is a 4 × 4 in. square piece of 1/2-in. thick steel plate which is provided with four drill rod feet as shown. On this plate is mounted a pedestal carrying nest plates in which the two parts can be assembled and clamped, and an ejector slide

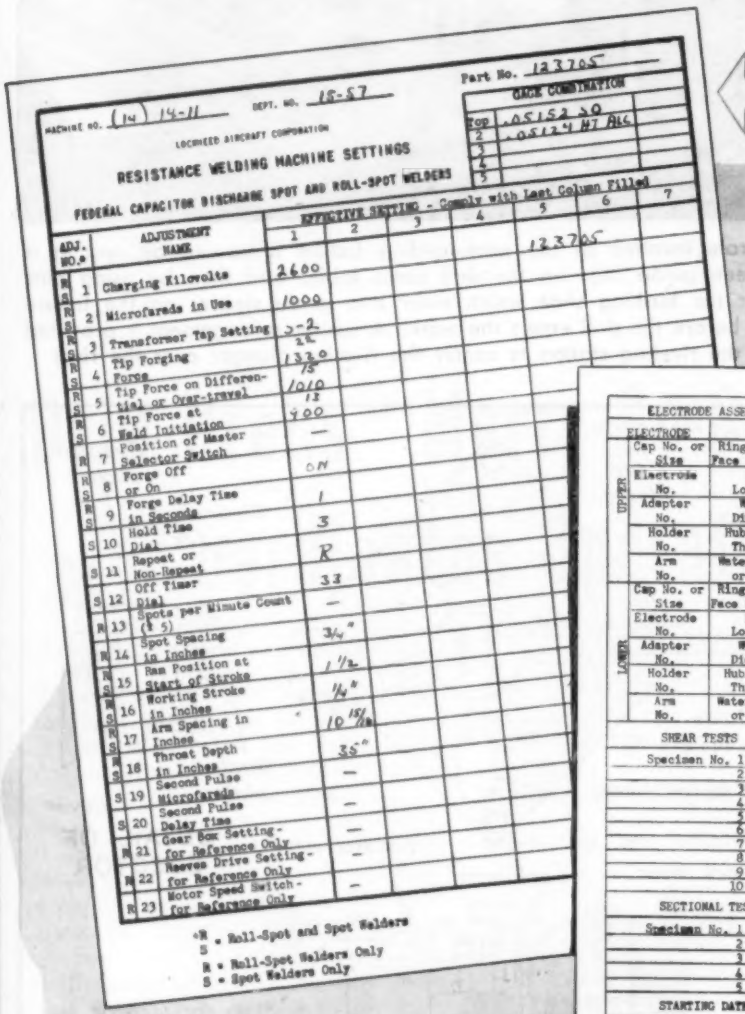
Recorded Tests Prove Effective

BY JOHN HOLDEN, LOCKHEED AIRCRAFT CORPORATION

SPOT AND SEAM welding operations on aluminum alloy parts require constant supervision if high-quality welds are to be produced consistently. Establishment of a quality control program in the welding department relieves the supervisor of keeping a close watch on all operational details and he is in a position to rectify jobs showing poor welds.

Two simple forms are used by the Burbank plant of the Lockheed Aircraft Corporation for maintaining quality control records of aluminum spot welding projects. One form records the effective settings on a given resistance welding machine for a particular spot or seam welding operation and also details the test results on weld specimens used to certify the original settings. The second form records the pull test values for specimens welded on each machine at regular intervals. This latter record serves as a regular check on the quality of welds.

Experience shows that no two resistance welding machines have exactly the same characteristics. Even when similar machines are set up for welding the same assemblies, slight differences in set-



MACHINE NO. (14) 14-11 DEPT. NO. 15-57 — LOCKHEED AIRCRAFT CORPORATION

RESISTANCE WELDING MACHINE SETTINGS

FEDERAL CAPACITOR DISCHARGE SPOT AND ROLL-SPOT WELDERS

Part No. 123705

GAGE COMBINATION

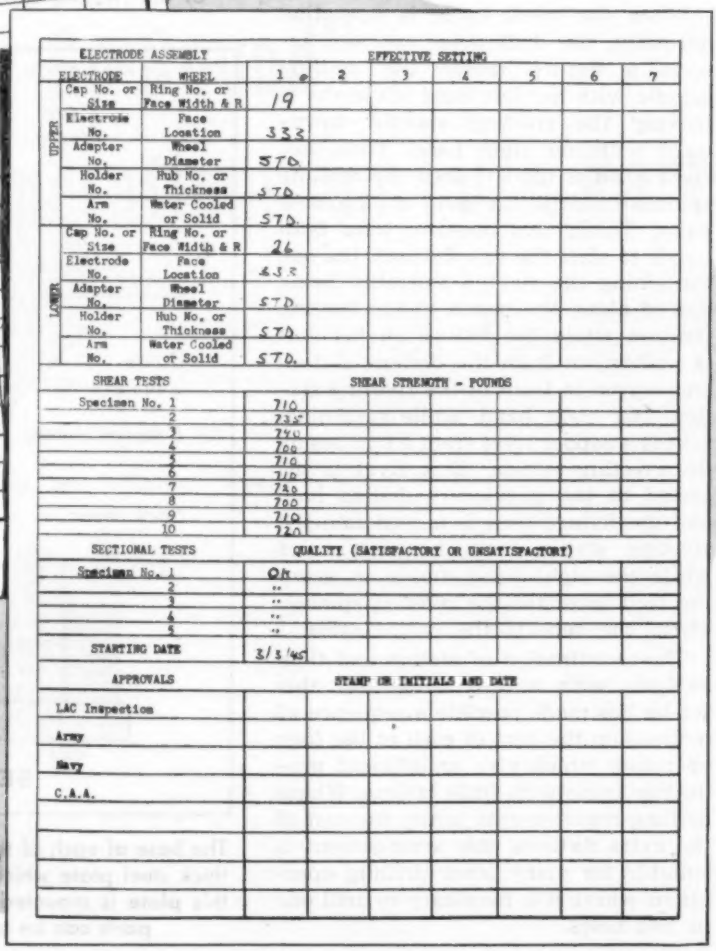
Top	.051520
2	.051241 MT ALC
3	
4	
5	

EFFECTIVE SETTING - Comply with Last Column Filled

ADJ. NO.*	ADJUSTMENT NAME	1	2	3	4	5	6	7
						123705		
R S	1 Charging Kilovolts	2600						
R S	2 Microfarads in Use	1000						
R S	3 Transformer Tap Setting	2-2						
R S	4 Tip Forging Force	1330 / 75						
R S	5 Tip Force on Differential or Over-travel	1010 / 12						
R S	6 Tip Force at Weld Initiation	400						
R	7 Position of Master Selector Switch	—						
R S	8 Forge Off or On	ON						
R S	9 Forge Delay Time in Seconds	1						
S	10 Hold Time Dial	3						
S	11 Repeat or Non-Repeat	R						
S	12 Off Timer Dial	33						
R	13 Spots per Minute Count (± 5)	—						
R	14 Spot Spacing in Inches	3¼"						
R S	15 Ram Position at Start of Stroke	1 1/2						
R S	16 Working Stroke in Inches	¼"						
R S	17 Arm Spacing in Inches	10 15/16						
R S	18 Throat Depth in Inches	35"						
S	19 Second Pulse Microfarads	—						
S	20 Second Pulse Delay Time	—						
R	21 Gear Box Setting - for Reference Only	—						
R	22 Reeves Drive Setting - for Reference Only	—						
R	23 Motor Speed Switch - for Reference Only	—						

*R = Roll-Spot and Spot Welders
S = Roll-Spot Welders Only
R = Spot Welders Only

The set-up man in the resistance welding department records welding machine settings on the front and reverse sides of this form for each welding operation. Where the same operation is performed on the two or more different welding machines, a separate record sheet is made up for each of the machine set-ups, because no two welding machines are exactly alike and often the required settings vary considerably



ELECTRODE ASSEMBLY			EFFECTIVE SETTING						
ELECTRODE	WHEEL	1	2	3	4	5	6	7
UPPER Cap No. or Size	Ring No. or Face Width & R	19						
UPPER Electrode No.	Face Location	33						
UPPER Adapter No.	Wheel Diameter	STD.						
UPPER Holder No.	Hub No. or Thickness	STD						
UPPER Arm No.	Water Cooled or Solid	STD.						
LOWER Cap No. or Size	Ring No. or Face Width & R	26						
LOWER Electrode No.	Face Location	33						
LOWER Adapter No.	Wheel Diameter	STD						
LOWER Holder No.	Hub No. or Thickness	STD						
LOWER Arm No.	Water Cooled or Solid	STD.						

SHEAR TESTS	SHEAR STRENGTH - POUNDS
Specimen No. 1	710
2	735
3	740
4	700
5	710
6	710
7	730
8	700
9	710
10	720

SECTIONAL TESTS	QUALITY (SATISFACTORY OR UNSATISFACTORY)
Specimen No. 1	OK
2	"
3	"
4	"
5	"
STARTING DATE	3/3/45

APPROVALS	STAMP OR INITIALS AND DATE
LAC Inspection	
Army	
Navy	
C.A.A.	

On the rear side of the form recording machine settings are listed the effective setting for the electrodes and the records for qualifying test strips

In Maintaining Welding Quality

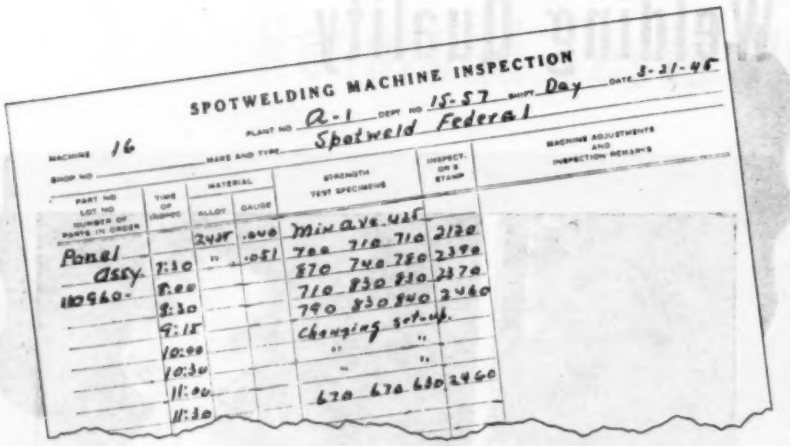
tings are necessary to obtain identical results. Therefore, the set-up man in Lockheed's resistance welding department uses a loose leaf book for recording the effective settings for each of the different welding operations to be performed on the various machines. When the same part is to be welded on two or more machines, one of these forms is made up for each of the machines.

When setting up a new job, the set-up man selects the electrodes and the machine settings as dictated by experience, or by comparing the new assembly with a similar assembly previously welded, and sample welds are made on 15 shear test strips. These strips are inspected to certify the machine settings selected. Ten test strips are pulled in a Riehle tensile testing machine, and five test strips are sawed and etched to check penetration characteristics of the welds. Usually, these checks are all that are necessary to certify a given welding set-up. However, where there is some doubt, a fully welded assembly will be tested to destruction. If the original test strips do not show the

Consistent reproduction of specified weld conditions is insured by a simple control system employed at the Lockheed plant in Burbank. Many small assemblies, like the one shown, are welded in this department. Complete records are kept of each set-up

Shear test strips are pulled in a Riehle tension testing machine, and each test is recorded on an inspection form. If the test results are not within specified limits the inspector arranges for the adjustments

To insure continuous production on welds which meet specifications, three test strips of the same material and the same thickness as used in the product are welded each half hour at each welding machine



SPOTWELDING MACHINE INSPECTION

MACHINE 16 PLANT NO A-1 DEPT NO 15-57 SHIFT Day DATE 3-21-46

SHOP NO ____ MAKE AND TYPE Spotweld Federal

PART NO LOT NO NUMBER OF PARTS IN ORDER	TIME OF INSPEC	MATERIAL ALLOY	MATERIAL GAUGE	STRENGTH TEST SPECIMENS	INSPECTOR'S STAMP	MACHINE ADJUSTMENTS AND INSPECTION REMARKS
Panel Assy 180960-	7:30	24ST	.040	Min Avg. 425		
	8:00	"	+.051	700 710 710	2120	
	8:30			870 740 780	2390	
	9:15			710 830 830	2370	
	10:00			790 830 840	2460	
	10:30			Changing Set-up.		
	11:00			" "		
	11:30			670 670 630	2460	

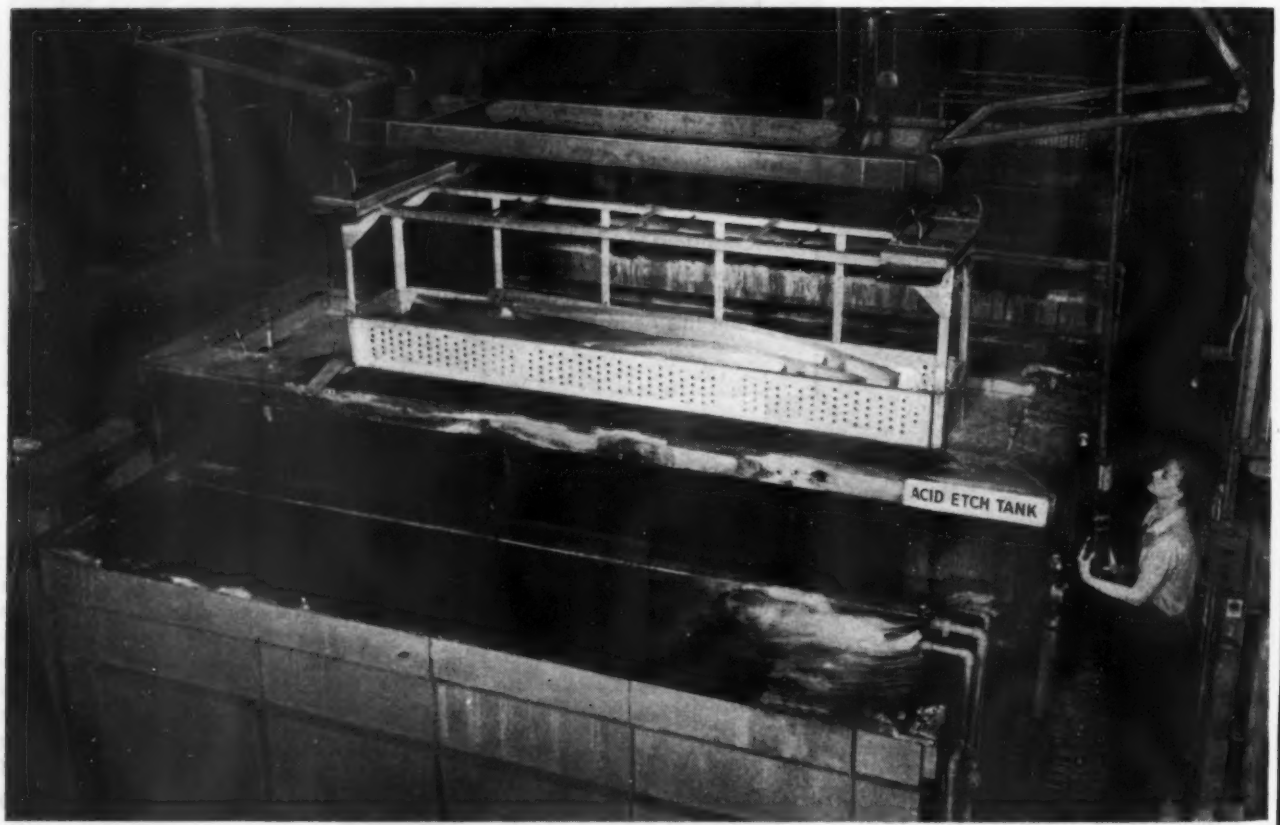
A spot welding inspection form is made up for each welding machine in the department, so that shear test specimens can be properly reported. It will be noted that three specimens are tested each half hour

specified characteristics, the machine settings are changed and another set of strips are checked.

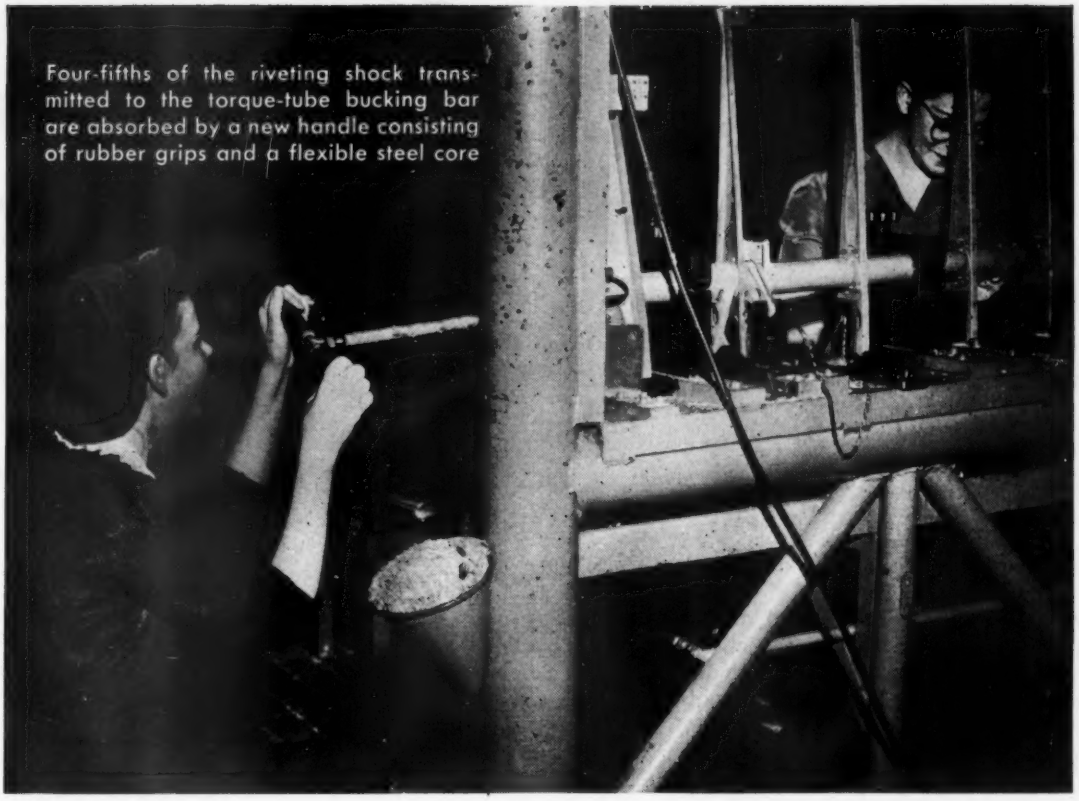
The set-up form records the settings for each of these trial set-ups so that a record is available of the results obtained with each particular group of settings. Once a set-up has been certified, the settings are reproduced each time the job is run. When a job is reset-up three test strips are pulled before production is started to insure accuracy of the settings. If these show different conditions, the machine is readjusted and the 15 test strips are run as before. Then, the new settings are recorded on the control card.

Once a machine has been set up for production welding, and test strips have been certified, the operator welds three test strips every half hour, or oftener if desired by the inspector. These strips are pulled for shear test readings. If the recorded values rise or fall outside specified limits the operator of the tension testing machine advises the set-up man and the welding machine is shut down for adjustments. At no time is a resistance welding machine used for production work unless it is making acceptable test strips at regular intervals. If the shop set-up man cannot adjust a welding machine to make welds which pass inspection requirements the machine is shut down and turned over to the maintenance department for repair.

All welding tips and wheels for the resistance spot welders and seam welders are identified by number so that they can be reproduced in the various welding set-ups without depending upon the memory of the set-up man or the foreman. Replacement of tips and wheels is left to the judgment of the operator of the welding machine, but inspection of the test strips every half hour insures that he is changing tips or wheels when necessary.



Proper cleaning is essential if good welds are to be made in aluminum alloys. Lockheed's cleaning cycle is: (1) dip for 5-10 min. in 180 deg. F. hot water and alkaline soap solution, (2) rinse in hot water, (3) etch in Oakite No. 84-A for 6½ min. under control of a time clock and gong, (4) rinse in hot water, (5) air dry. For these cleaning operations, the parts are placed in a stainless steel basket suspended from electric hoists



Four-fifths of the riveting shock transmitted to the torque-tube bucking bar are absorbed by a new handle consisting of rubber grips and a flexible steel core

Rubber Inserts Cut Riveting Troubles

BY ALEX CARLSON, DEVELOPMENT ENGINEER
LINDEN PLANT, EASTERN AIRCRAFT DIVISION, GENERAL MOTORS CORPORATION

RIVETERS working on assembly of aircraft sub-assemblies, especially the women operators, complained of swollen wrists and objected to noise. In fact, many crews asked for transfer to other operations, and absenteeism was a problem. To correct this situation, we made a study of underlying causes and instituted certain changes in tools.

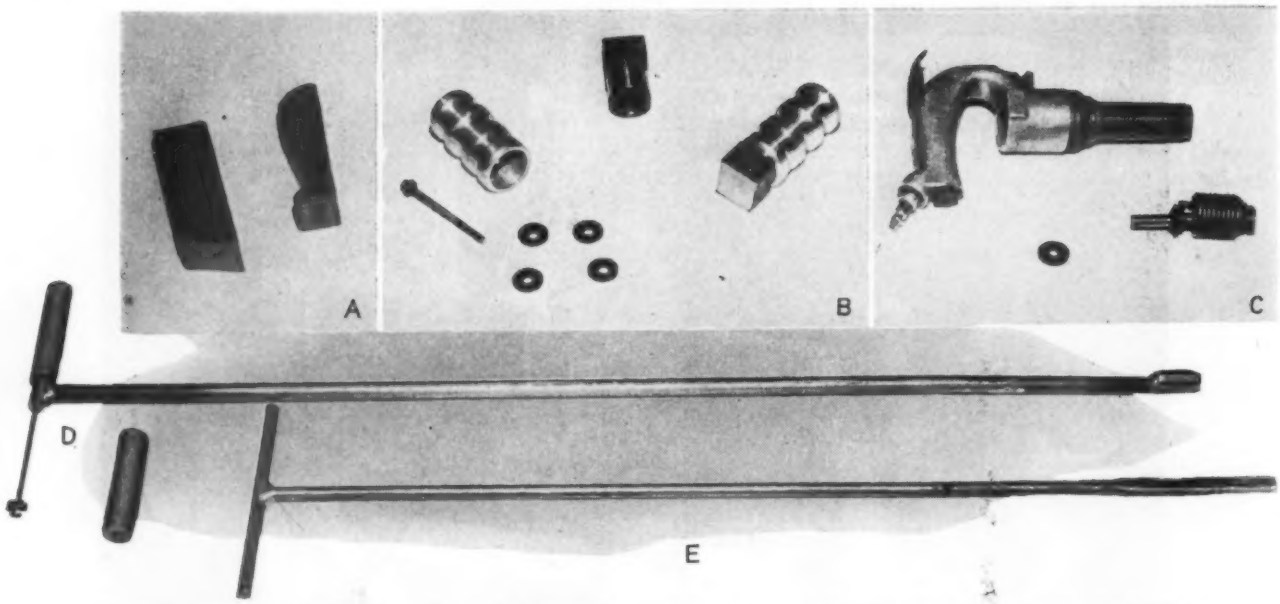
The trouble occurred when operators were using either solid hand bucking bars or the long T-handled torque tube bars employed when riveting wing-flap ribs to the tubular spar. Obviously, the rivetgun operators were likewise subjected to shock. So we speedily contrived various adaptations of rubber inserts for these tools. These efforts directly reduced operator fatigue and stepped up department efficiencies. The noise level within departments was sharply reduced. All in all, our workers appreciated the changes, stayed on the job, and maintained production schedules.

Pneumatic rivet guns were modified by putting a rubber washer under a shoulder on the stem of the rivet-set plunger. Only a single washer could be used here because of space limitations and the need for maintaining a secure grip of the set-retaining spring on the barrel of the tool.

The long T-handled bucking bars originally had a solid cross-piece which was gripped by the operator with both hands. It was reasoned that the handle should be replaced with a construction that would absorb riveting shock and yet permit the operator to manipulate the bar effectively. To this end, the handle was cut off close to the bar and a hole was drilled through the remaining section. Into this hole we inserted a new handle consisting of a piece of drill rod much smaller in diameter than the original handle. Rubber grips, retaining nuts and washers completed the assembly. In operation, the handle of the modified bucking bar has enough springiness to absorb part of the shock, and the rubber grips are a further help.

Shop tests reveal that shock transmitted to the bodies of rivet-gun operators and helpers is reduced sharply by simple changes in guns and bucking bars

From handling the solid bucking bars, it was evident that they were too heavy and clumsy for convenient use by female operators. Moreover, a considerable amount of high-quality steel was tied up in each



Riveting equipment before and after modification: *A*—old-style solid hand bucking bars; *B*—"Universal". lightweight hand bar in disassembled and assembled conditions; *C*—rubber washer used in pneumatic rivet gun to cut shock in half; *D*—modified T-handle torque-tube bucking bar, showing flexible steel handle core and rubber grips; *E*—old style T-handle bucking bar

bar, and this waste was accentuated by the constant need for new bars with different styles of anvils. These objections have been overcome by development of a lightweight "universal" handle that will take almost any style of anvil providing that it has a standard shank diameter.

The aluminum handle has three grooves turned on the outside for a good grip. One end is counterbored to receive the shank of the anvil and a steel back-up block. Four rubber washers inserted in the anvil shank cushion the blow against the backup block. A retaining screw prevents the anvil from dropping out of the handle. This assembly is much lighter than any previous solid bucking bar. In addition, the handle components can be transferred to other anvils.

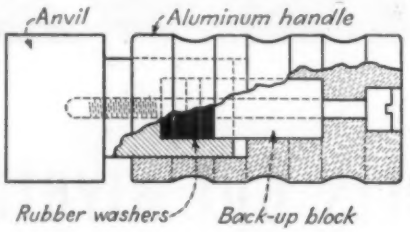
Shop tests made with the aid of the General Radio Corporation disclosed these advantages of "rubberized" tools in reducing vibration transmitted to the operator's hands. These tests of tool velocity were carried out with a vibration meter. The results were:

T-handled bucking bars used on flap assembly:
Old-style—10 to 30 in. per sec.
New style—2 to 5 in. per sec.

Hand bars:
Solid bar—20 to 30 in. per sec.
Cushioned bar—5 to 10 in. per sec.

Rivet gun:
Without washer—10 to 20 in. per sec.
With washer—5 to 10 in. per sec.

The improvements realized can be stated in another way: with the new handle and rubber grips, T-handled bucking bars transmit about one-fifth or one-sixth of shock formerly encountered. The cushioned hand bar reduces impact to one-fourth the former amount. Use of a single washer in a pneumatic rivet gun cuts shock transmitted to the operator by half.



Anvils are made with a standard shank diameter to fit interchangeably into the aluminum handle. This lightweight construction minimizes shock, fatigue, and the incidence of "riveters palsy"

Foremen report that introduction of the rubber-cushioned tools in their departments has reduced fatigue and brought a favorable reaction from operators. The temperature of the tool is an important factor in causing "riveter's palsy," and this malady has been reduced to a minimum because both the new types of bucking bars draw little heat from the operator's hands. Undoubtedly, there are other shop tools which would benefit from introducing a rubber insert at the proper point.

Straight Punches

BY CHARLES WESLOW

RECENTLY, I was employed in a plant previously engaged in the manufacture of sheet-metal roofs and ventilators. It is now producing aluminum alloy sheet-metal boxes, having all kinds of holes pierced in all the sides and welded together by an expensive machine with copper points which presses the spots together while the electric current does its stuff.

The owners of the plant knew nothing about how the piercing punches should be made. They thought that when you fasten a piece of ⅜-in. drill rod into a spring collet, that its good enough, that way, to turn a 0.126-in. punch on the end of it ½ in. long, and 2-in. overall. The foreman gave me such a broken punch which I had to duplicate. The boss himself asked me why I had 2¼ in. of 7/16-in. rod protruding out of the collet, and remarked that his spare-time toolmaker always made them out of ⅜-in. drill rod, while I turned them out of 7/16.

I showed him the broken punch, and told him it broke because it was not straight enough to line up with the punch holder and die.

Their previous experience was in the use of piercing punches, which fitted the die hole like a peanut in a shell, which I admit is the way a fit should be when piercing 3/32-in. sheet steel.

Practical Ideas

HAVE YOU A PRACTICAL IDEA? . . . If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Direct-Reading Protractor for Correction of Static Unbalance

BY HARRY L. WAKE
Philadelphia Navy Yard

To reduce the pencil work required to compute the angles between correction points in connection with static balancing operations, a simplified instrument was made of a level attached to a protractor mounted on the steel scale of a centerhead. With this assembly, direct reading of the correction angle is obtained.

In 90 percent of all balancing there occurs a division of the correction weight between two angles, because it is not always convenient or possible to remove or add weight at the points where unbalance falls. So it is necessary to take two convenient points, one on each side of the resultant line and strike the right and left angles, making necessary the division of the weight according to the angles.

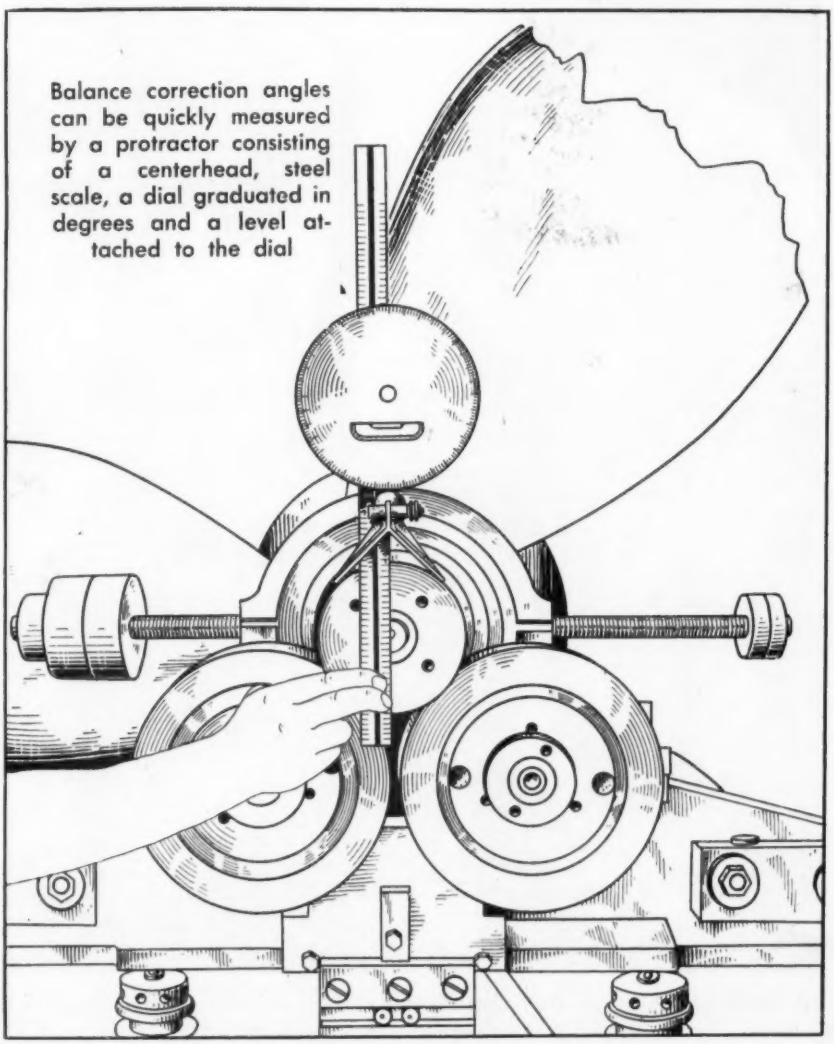
These angles should be known to the degree and minute before the weight, which is already estimated, can be divided proportionally between the two different angles. It can be seen that the heavy side nearest the point of unbalance will require more weight than the one further away.

The usual method is to place the part to be balanced on the rolls of the balancing machine with the clamp extended line on the top dead center. This line, laid out on the face of the hub, passes through the point of unbalance of the heavy side: on each side of this line are laid out other lines passing through the places where the metal can be added to or subtracted from.

An arc is scribed on the face of the hub by using dividers centered on the shaft. Where this arc cuts the three lines passing through the center, a center dot is made. Dividers are used to take off the distance from the punch mark on the clamp extended line to the punch mark on the right or left.

Let us say the reading from the clamp extended line is 13.7 centimeters and the hub arc radius is 20 centimeters; we have 13.7 divided by 2 times 20, giving 0.3425, which is the sine of 20 degrees, or the included angle is 40 deg. This is due to the fact that a triangle of two equal sides is formed by the chord connecting the ends of two radii. The included angle is found as follows—sin ½ the included angle equals the chord divided by twice the radius, which explains the foregoing computation.

An improved method is to read the angles directly. The instrument used to measure these angles consists of a level attached to a pro-



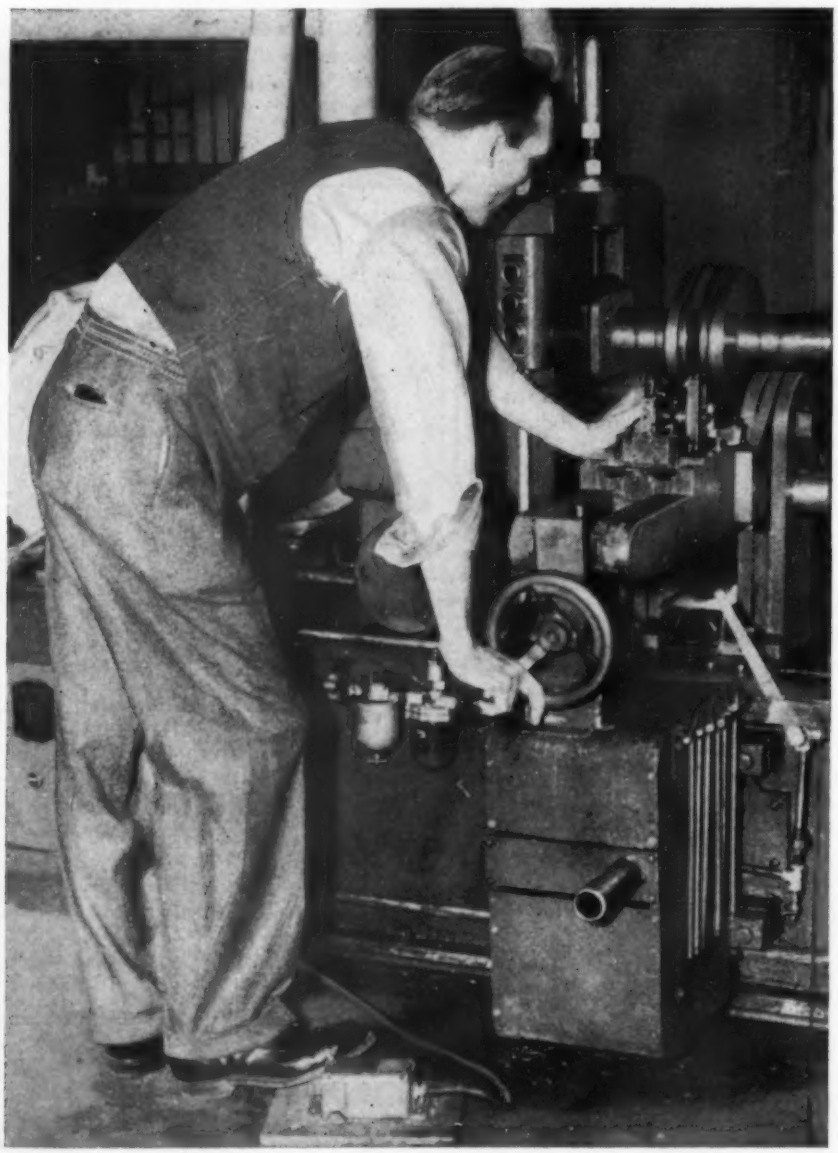
Balance correction angles can be quickly measured by a protractor consisting of a centerhead, steel scale, a dial graduated in degrees and a level attached to the dial

tractor reading 180 deg. on each side of the centerline, this protractor is mounted on a steel scale and held in position by a thumbscrew; the scale passes through a centerhead.

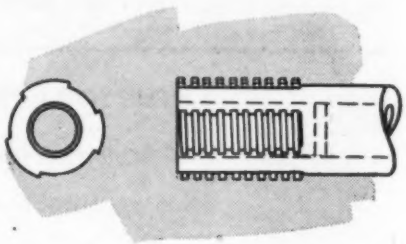
In use, the protractor is set to zero and tightened to the scale by a thumbscrew. The assembly is placed on the hub or mandrel of the piece to be balanced. The clamp extended line is picked up by the edge of the scale and the job lined-up so that the bubble on the protractor shows that everything is square and on the level. The assembly is now moved to the right, or left, and the respective lines picked up by the pointer. The protractor is loosened and revolved until the bubble indicates level, then it is locked in position. The reading can then be taken in minutes and seconds directly from the lining-up edge of the scale.

This device can be adjusted to any size of work within the limits of the scale and can be used for balancing propellers, armatures and rotating parts of fans and turbine rotors. Other rotating elements can be accommodated.

Elimination of extensive calculations is the chief advantage gained from this instrument. It has resulted in a saving of about 600 dollars yearly. *Suggestion submitted under the Navy Employees' Suggestion Program.*



A foot control switch frees both hands to control the movements of the machine to follow the contour with accuracy



Carbide tips can be used in cutting the threads on this tube by performing the turning operation before slotting

Changing Order of Operations Boosts Production 30 percent

BY THOMAS FORSYTH, JR.
Cowdrey Machine Division,
American Type Founders, Inc.

Pack howitzer tubes must be provided with interrupted threads at the base. These are machined by cutting the interrupting slots on a shaper and by cutting the threads on a lathe.

It was the practice to perform first the shaping and then the turning operation. It was found that by reversing the sequence of operations, carbide tips could be used for cutting the thread. The lathe could then be speeded up enough to increase production by 30 percent. An incidental effect was that less stock remained to be removed in the slotting operation. *Suggestion from the Board for Individual Awards, War Production Drive.*

Both Hands Control Work When Foot Switch is Used

BY J. KEMMERLING
Douglas Aircraft Company, Inc.,

Cutting contours requires the use of both hands for manipulating the machine controls and there are occasions when stops must be made quickly. If one hand is free of the controls to throw the switch, time is lost and work may be spoiled.

A foot control switch at the front of the machine with a free length of cable can be placed to the convenience of the operator. With both hands on the controls, contour work can be performed speedily and accurately at a saving of time and material. *Suggestion from the Board for Individual Awards, War Production Drive.*

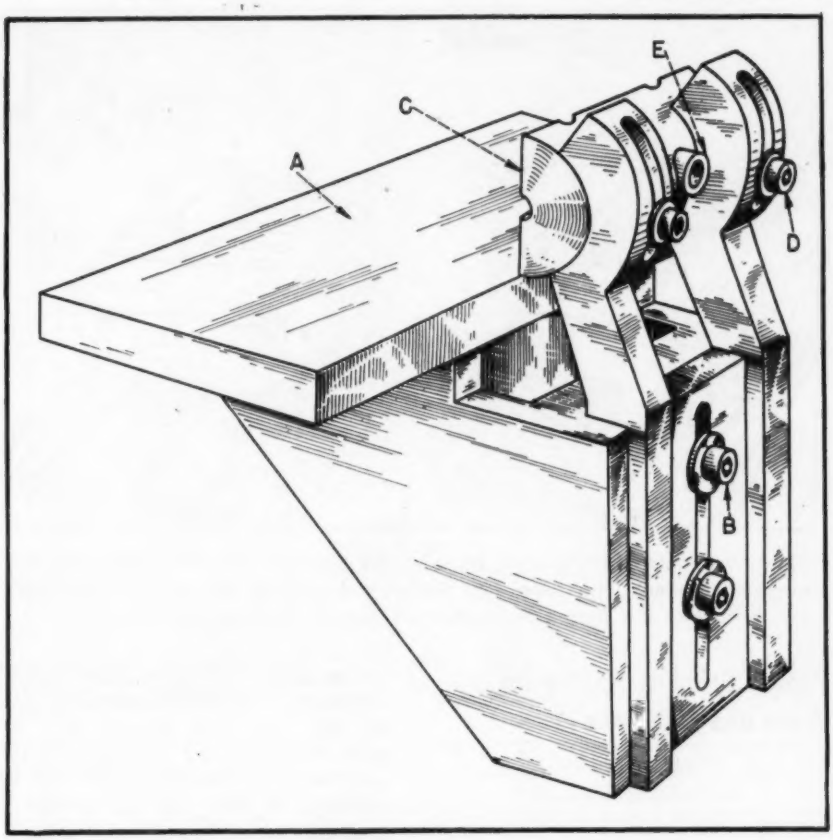
Single Plane Adjustable Drill Jig Accurately Locates Angular Holes

BY ALBERT SOMMERS

Drilling and reaming bushing holes on angular surfaces of drill jigs and other tools has been facilitated by the development of a special locating jig at Vultee Field Division of Consolidated Vultee Aircraft Corporation. Within the limits of the clamping slots in the supporting frame, this jig can be set at any angle to the base, and makes it possible for an unskilled operator to produce work within tolerances of plus or minus 0.001 in. when using a portable electric drill motor.

As shown, this jig has a base *A* which is locked, after adjustment for height, with socket head cap screws *B*. The universal swivel drill bar *C* is milled and ground to exactly one-half of its diameter. This bar can be rotated to the desired angle, set with a sine bar, and then locked by the socket-head screws at *D*. Drilling or reaming is done through the interchangeable bushing *E* located at the exact center of the bar. This maintains a constant elevation on the hole in the part for any unit angle.

Through the development of this jig, individual set-ups involving lengthy mathematical calculations have been eliminated and greater accuracy obtained. Heretofore, it was necessary for a skilled toolmaker to set-up a jig borer for each individual hole to be bored.



Skill and time required to drill and ream angular bushing holes in jigs and other tools has been reduced materially through development of this jig

Index Plate on Lathe Chuck For Accurate Angular Laying-Out

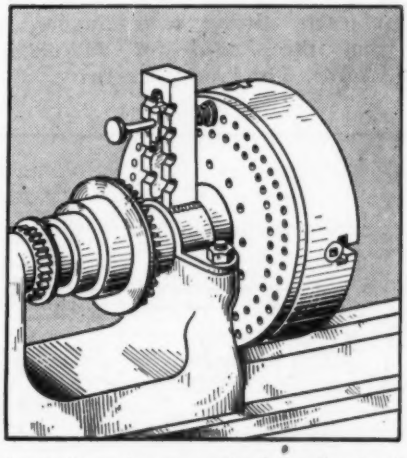
BY GEORGE HOLMAN

Sometimes it is necessary to mark work accurately, before removing it from the lathe, to locate holes, keyways or some other purpose. There are instances where keyways, holes, slots or machined surfaces must have an accurate angular relationship to each other. This is especially true in job shops where there is not too much equipment for laying out.

On the back of the rim of the largest step of the cone pulleys, of some lathes, there may be a large number of holes which can be used for dividing the circle, but most lathes do not have any means for indexing.

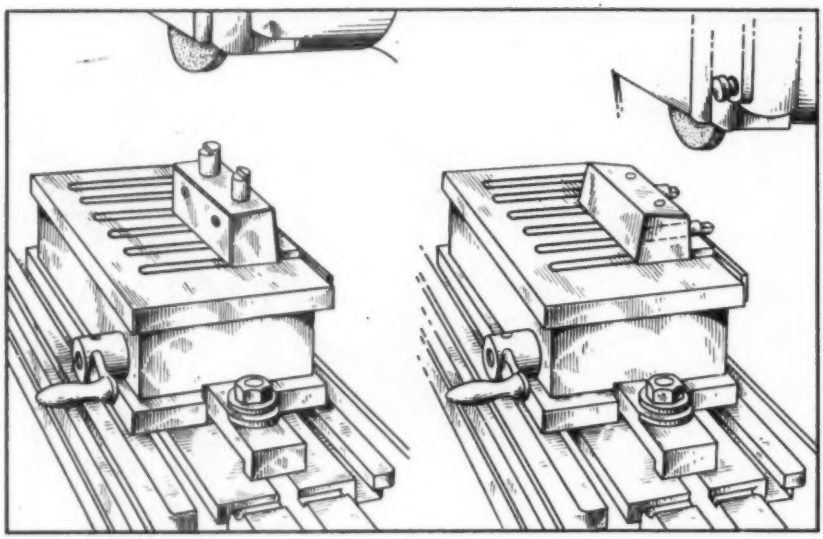
When there is enough work to demand an index plate, one can be mounted on the back of the chuck or faceplate of the lathe, as shown in the accompanying illustration.

A piece of steel plate can be bored to center on the hub or some other convenient projection on the back of the chuck. This plate is scored lightly for several diameters of circles and the circles are laid out for various divisions. The usual grouping occurs for 22½ deg. which requires 16 spaces, larger circles can be graduated for 7½ deg., 6 deg., and 5 deg., resulting in 48, 60, and 72 spaces respectively which will cover any reasonable demand. At each division point, holes are drilled to take the indexing pin. Because the larger angles are most common, and there are fewer spaces, the smallest circle is used most often.



An index plate attached to the back of the chuck or faceplate provides a positive means for angular laying-out while the workpiece is in the lathe

The index pin is placed in a rack mounted on the bearing-cap of the headstock. This rack is slotted lengthwise so that the index pin can be moved from circle to circle: the sides of the frame are notched for a crosspin position for each hole circle. A spring holds the index pin in its hole when the crosspin is in the slot in the rack. For turning cuts on the workpiece, the index pin must be disengaged from the index plate. To prevent the index pin from disengaging the rack, when the pin is in the hole, there is a washer between the cross pin and the bottom of the slot.



Right—When the fixture is on its side, the top rake can be duplicated any number of times with precision. Left—Front rake is ground with accuracy when the fixture base rests on top of the magnetic chuck

Toolbit Grinding Fixture For Front and Side Rake

BY MAX W. RAMSEY
Packard Motor Car Co.,
Marine Engine Division

Round toolbits, tipped with carbide have to be dressed accurately to obtain the best results from this material. To set this bit under customary conditions meant the use of an angle, a clamp and a protractor; each tool had to be set up individually, requiring much time to place each tool without much assurance that the angle would be correct.

It was decided to make a fixture to hold these bits in position during grinding so that accurate angles could be repeated.

A block of steel was ground with one side at an angle of 85 deg. (this being the rake and clearance angle). Holes, slightly larger than the bit diameter, were drilled parallel to the 85 deg. side, but square with the base, and holes for setscrews drilled and tapped. Holes for different diameters of bits can be drilled in each block.

To grind the bit, it is placed in its correct hole and the setscrew tightened. The wheel is then brought down and a cut taken; when this side is dressed, the block is turned on its 85 deg. side and the other face dressed without changing the setting of the tool in the block. In this way, both faces are ground in proper relation to each other.

This fixture has eliminated a great deal of set-up time and all its uncertainty. The result is the assurance of always having the desired angle on each cutting face. *Suggestion from the Board for Individual Awards, War Production Drive.*

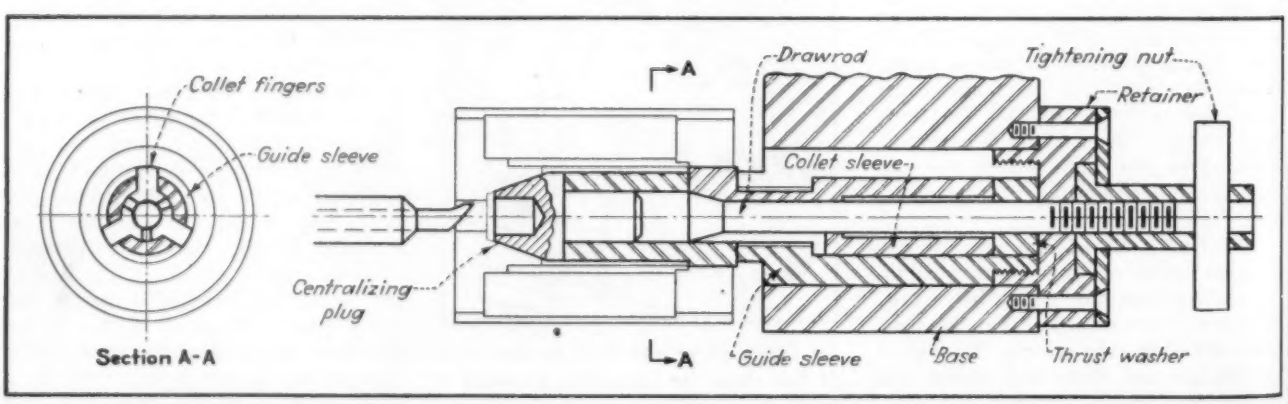
Close Tolerance and Concentricity Held by Expanding Boring Fixture

BY EDWARD LAY
Supervisor of Tool Design
Fairchild Camera & Instrument Corporation

The workpiece is an assembly into which a bushing is inserted in the front. This bushing must be bored to plus 0.0005 in. tolerance and concentric to a conical interior surface close to the bushing and the cylindrical bore at the back.

The fixture utilizes the principle of the expanding collet in which a drawrod with a conical head presses three fingers against the interior of the workpiece and holds it rigidly central while boring the hole in the workpiece. The workpiece centralizes itself upon a conical plug and the three pressure fingers.

An examination of the design shows that a centering plug is pressed into the end of the guide sleeve, which is solid at this end. A little further along, the guide sleeve has three slots milled to locate the three pressure fingers on the end of the collet sleeve. Compression pressure is taken by the thrust washer. The collet sleeve has a central clearance hole to pass the drawrod freely: at the finger end this hole is tapered to fit the drawrod. Slots are used between each finger to provide for the expansion of the fingers. This sleeve is held in position by screwing it into the retainer. The retainer locates and holds in position the tightening nut; it is fastened to the base. The drawrod is tapered at one end similar to a countersunk head bolt or rivet; the other end is threaded to receive the tightening nut. The tightening nut fits into the retainer, has a handle for convenience in tightening and threads on the end of the drawrod.



The workpiece is located by a tapered plug and three fingers which grip the piece firmly while machining

Operation consists of placing the workpiece in position on the centralizing slug, holding it there until the drawrod has been pulled up tightly. With the workpiece centralized on a taper plug and three collet fingers, accurate boring of the end bushing can be done quickly.

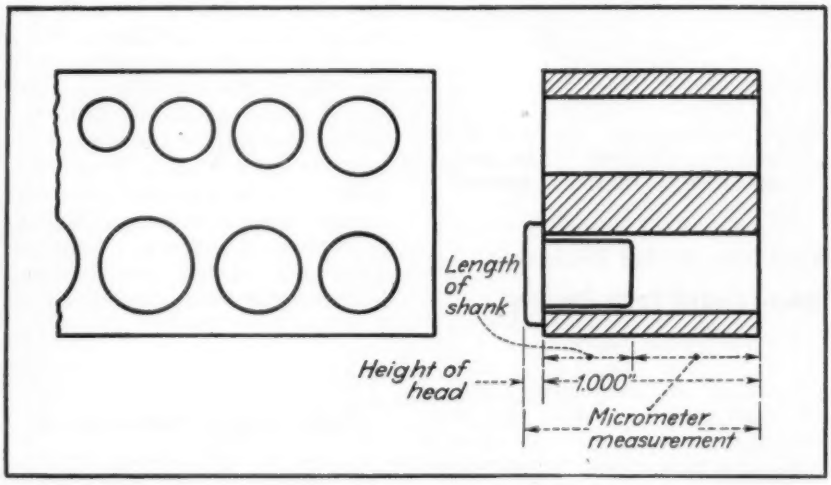
Fork Lift Operator Lifts Flat Boxes Without Help

BY M. E. BROWN
Glenn L. Martin—Nebraska Company

The simple wedge-shaped block with a long handle bolted to it at the angle shown in the illustration helps in handling packing crates which have not been palleted. The wedge is 2-ft. long and has a 5½-ft. handle mounted at a 45 deg. angle.

The operator tilts the box with the tips of the fork, places the wedge under the box, lifts the box, and picks up the wedge—all without leaving his seat. *Suggestion from the Board for Individual Awards, War Production Drive.*

Heavy, flat-bottomed boxes which have not been placed on pallets can be picked up without help by a fork-lift operator with the aid of this long-handled wedge and without leaving truck



Shank lengths from narrow shoulders or under heads, or the height of heads, can be measured very accurately by the use of a block of known thickness with a large number of holes

Universal Gaging Fixture for Shouldered Machine Parts

BY LAWRENCE J. WIDERSKI
Machining Inspector
Cutler-Hammer, Inc.

Small parts upset by headers or turned on automatic lathes have shanks or heads which must be measured accurately. Due to narrow shoulders, the usual methods cannot be depended upon, because there is no way to attach a micrometer or indicator.

One method to measure this distance is to drill holes of many diameters into a piece of known thickness, then insert the piece into a hole just a trifle over the shank diameter, but not large enough to pass the shoulder.

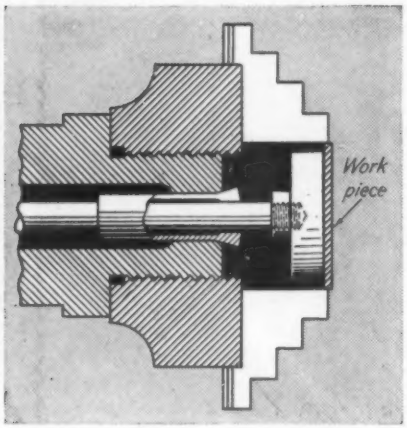
If a block is made to 1.000 in. plus or minus a very small amount, then any measurement from the surface to the end of the shank subtracted from one inch will give the length of the shank from the shoulder, or the micrometer can be read backwards.

When the shank is smaller in diameter than the depth micrometer spindle, the hole is counterbored to pass the spindle freely, but it must not break through. Where there is a small fillet at the shoulder, the hole should be large enough to bear on the important part and not rest on the fillet.

If a head is to be measured for height, the total micrometer reading less the block thickness will give the height of the head. The proper hole for the shank must be chosen.

Because of the diversity of diameters, a large number of holes will be required to make this gaging method broad enough in its application. But for longer runs, blocks with a limited number of holes might be more useful.

The block has been used successfully to check round-head rivets, flat-head shouldered pins and pieces with slots in the stem.



A backstop prevents the plate from bending and the chuck jaws hold the disk while it is being faced in the lathe

Backstop Permits Facing Thin Metal in a Lathe Chuck

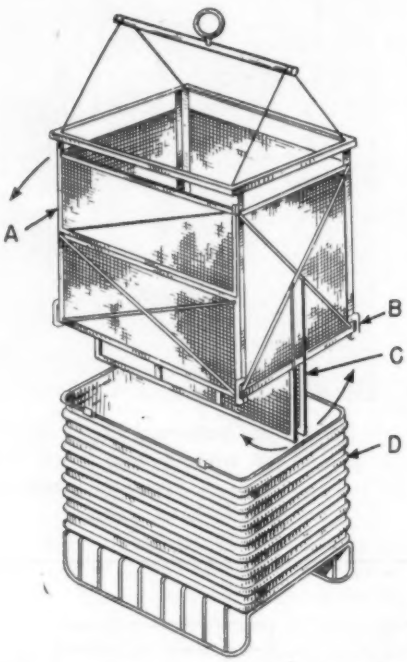
BY C. S. BEACH

Facing thin metal disks in a lathe chuck is a difficult matter because the metal will deflect under the cuting pressure of the tool, preventing satisfactory finishing.

A method to hold the thin disk in position is to back it up throughout its rear surface while the piece is chucked in the lathe. The idea is to use a collet in addition to the chuck.

A piece of bar stock is turned to fit the largest size collet, the end is turned to a smaller size to obtain a good square shoulder, then this end has a thread chased on it. A disk is faced off, drilled and tapped to fit the arbor, completing a button which will fit inside the chuck jaws; sizes of buttons will be required to cover the various diameters of disks encountered.

If a 2½ in. diameter of disk is to be faced, then a 2⅜ in. diameter backstop is selected. There is really no unsupported surface, so the metal is braced by the backstop and gripped by the chuck. Several sizes of disks will be necessary to handle various sizes of workpieces.



Quick charging or discharging of a basket is obtained by the use of doors at the top and bottom

Trap-Door Basket Discharges Heat-Treated Parts Quickly

BY BERT BROWNE

Loading and unloading baskets of small pieces amounts to a considerable item at the end of each day, so a basket with hinged doors at the top and a trap door bottom has been used at the Vultee Field Division of the Consolidated Vultee Aircraft Corporation to reduce this loss as much as possible.

Hinged doors *A* at the top of the basket assist materially in the loading operations, while trap doors *C* at the bottom permit rapid discharge of the contents into a tub or skid *D*. Latches *B* hold the doors closed until the time comes for releasing them. This device would be valuable when handling acid-dipped parts or those processed in other solutions.

Ball-Bearing Rollers Speed Laying-Out and Burning

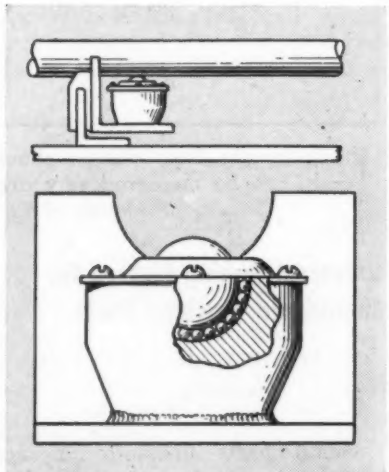
BY E. M. ATHERTON
Marinship Corporation

The usual laying-out tables for heavy bar stock are either steel plate, flat bar stock or angles. After the table has been in use, there are many irregularities due to slag spots and burns, all of which caused much difficulty whenever a bar was to be turned.

Ease of operation was obtained by using ball bearings from a ball table. These assemblies were welded to the inside of large angles. The upstanding leg of the angle is burned out to a half circle for two purposes, to act as a retainer for the heavy bar and to clear the bar when it was on the roller.

The layout table consists of a series of angles with upstanding legs. The angle carrying the ball bearings has two brackets welded to the back of the upstanding leg to act as clips for hanging the ball assembly at any position on the table. These assemblies are spaced as desired.

Prior to the use of these rollers, two men required four hours to do the laying-out in addition to the aid of an overhead crane to handle the bar. With the roller arrangement, one man can do the work in three hours. The cost of these assemblies was but a few dollars. In addition, a great personal hazard was removed because the easier way of handling prevented accidents. *Suggestion from the Board for Individual Awards, War Production Drive.*



Heavy bar stock moves easily upon ball bearings

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Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive, the Navy Board of Awards to Civil Employees and the War Department Civilian Awards Board. Readers may find these ideas useful in their work.

★

Master Disks

COMMERCIAL STANDARD (EMERGENCY) CS (E) 124-45

AT THE INSTANCE of the War Production Board, a proposed commercial standard for master disks was circulated to manufacturers and leading user, distributor, and testing organizations for comment. A consensus of comment indicated that this draft was generally satisfactory. Those concerned have since accepted and approved the standard as shown herein for promulgation by the U. S. Department of Commerce, through the National Bureau of Standards. The standard is effective for new production from September 15, 1945.

Purpose

1. The purpose of this commercial standard is to provide minimum essential requirements for master disks described herein, as a basis for better understanding between sellers and buyers, and as a basis for fair competition and identification of master disks conforming thereto.

Scope

2. This standard covers the major essential requirements for master disks (American Gage Design) from above 0.105 in. to and including 8.010 in.

General Requirements

3. *Material.* For purposes of this standard, tool steel means a high quality electric furnace alloy steel, alloy tool steel, or carbon tool steel free from all imperfections which might mar the finished surface of the product.

4. *Seasoning.* For purposes of this standard, seasoning shall include an appropriate treatment for the artificial ageing of tool steel to prevent distortion or dimensional change after the surfaces have been finished.

5. *Finish.* For the purposes of this standard the following designations for surface finishes apply:

5a. *Ground.* All finish-ground surfaces shall be smooth and free from objectionable chatter, tool marks, irregular wheel marks, burning or scratches.

5b. *Lapped.* A lapped surface shall be lapped to give a uniform, truly cylindrical, smooth surface free from all traces of machining or grinding and shall show no evidence of objectionable scratching.

Detail Requirements

6. *Design.* Master disks shall be made according to the designs adopted by the American Gage Design Committee and promulgated in latest revision of "Gage Blanks, Commercial Standard CS8." Master disks shall be ground and lapped.

7. *Material.* Master disks shall be tool steel, hardened, drawn and seasoned, or material of equal or greater resistance to wear.

8. *Styles.* The styles of American Gage Design master disks are given in latest revision of CS8.

9. *Hardness.* Master disks shall have a minimum Rockwell hardness of C63 or equivalent surface hardness.

10. *Sizes.* Sizes of master disks range from above 0.105 in. to and including 8.010 in. in diameter.

11. *Accuracy.* Master disks shall be ground and lapped to specified diameter (nominal size) within the tolerances of the class specified, Table 1. These tolerances shall apply to all diameters between points 1/16 in. in from the ends of the full working surface. Total variations in roundness and/or taper shall not exceed one-half the size tolerance.

Methods of Test

12. *Cylindrical trueness (roundness and taper)* shall be tested in a comparator of suitable amplification. Roundness may be tested in a multiple-contact anvil such as a V-block. Any equivalent method may be used.

13. *Trueness to size* shall be determined at 68 F by means of a measuring machine, or a vertical or horizontal comparator of suitable amplification using gage blocks of suitable accuracy and with a 1-lb. measuring load, except that for nominal diameters above 4.510 in. a 2½-lb. load may be used. In making the above measurements the measuring accuracy of the instruments used should be adequate in relation to specified disk tolerances.

Packing

14. Each master disk shall be supplied in a suitable, protective case or box. As a protection against climatic conditions, each master disk shall be coated with a suitable noncorrosive oil or grease, and be securely wrapped in waxed paper or its equivalent.

Marking

15. *Size and class designation.* Where practicable, each master disk shall have legibly and permanently marked upon it in characters not less than 0.025 in. high the nominal size and class (XX, X or Y) of the disk.

16. *Manufacturer's name or trade mark.* Where practicable, each master disk shall have legibly and permanently marked upon it in characters not less than 0.025 in. high, the manufacturer's name or trade mark.

17. *Identification.* In order to provide purchasers with a ready means of identification, it is recommended that where practicable, each master disk which complies with this standard, be marked "CS(E)124-45."

Table I—Tolerance on Diameter for Master Disks
(Classes XX, X, Y, Gage Makers Tolerances)

Sizes		Total tolerance[1] on nominal size		
Above	Up to and including	Class XX	Class X	Class Y
In.	In.	In.	In.	In.
0.105	0.825	0.000 02	0.000 04	0.000 07
0.825	1.510	0.000 03	0.000 06	0.000 09
1.510	2.510	0.000 04	0.000 08	0.000 12
2.510	4.510	0.000 05	0.000 10	0.000 15
4.510	6.510	0.000 065	0.000 13	0.000 19
6.510	8.010	0.000 08	0.000 16	0.000 24

[1] *Tolerance may be taken in plus direction, minus direction, or split half above and half below nominal size, as specified by purchaser.*

STARRETT TOOLS

A Starrett "Mike" on the job at Consolidated Vultee Aircraft Corporation's Fort Worth Plant.

Checking the angle on a cam-action form die with a Starrett Bevel Protractor at Curtiss-Wright, Buffalo.

A Starrett Vernier Height Gage at Fairchild Aircraft Division of Fairchild Engine and Airplane Corp., Hagerstown, Md.

At an American Airlines shop a propeller is being checked by a Starrett Micrometer.

Starrett Calipers in action at Douglas Aircraft Co.'s Santa Monica plant.

Starrett Micrometers speed accuracy at Lockheed Aircraft Corp., Burbank, Cal.

where a *"Hair Off"* may mean a close shave . . .

you'll find STARRETT TOOLS

Your work, too, has no doubt had to meet higher standards of precision and uniformity at the same time you've had to turn it out faster than ever.

Starrett Micrometers, Vernier Gages, Dial Indicators and other fine measuring tools lend skilled hands the added confidence and sureness that has meant both accuracy and speed. In the strenuous competitive days to come you will find it equally worth your while to ask your mill supply man for Starrett Tools.

THE L. S. STARRETT CO. • ATHOL, MASSACHUSETTS, U. S. A.

World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

Grading of Diamond Powder

COMMERCIAL STANDARD CS123-45

Purpose

1. The purpose of this commercial standard is to provide a nationally recognized standard for grading diamond powder; to provide a basis for understanding between purchasers and sellers as to the quality and grade desired or supplied; and to provide a uniform method of guaranteeing conformance with the grade designated.

Scope

2. This standard covers material, grade designations, grain size and size range, amount of "fines" or particles smaller than the minimum for each designation, impurities, methods of sampling and inspection, and method of guaranteeing compliance with this standard.

Definitions

3. *Grade designations.* The grade designations employed in this standard are the arithmetical means, or whole numbers near the arithmetical means of the designated maximum and minimum grain sizes for the grade, expressed in microns (0.001 millimeter).

4. *Grain size.* For the purpose of this standard the size of the grain is one-half the sum of its longest dimension and the maximum dimension at right angles to its longest dimension, both measurements taken on the face exposed to view in the microscopic field and expressed in microns.

5. *Fines.* For the purpose of this standard a "fine" is any particle smaller than the minimum for any specified grade.

General Requirements

6. *Material.* Diamond powder shall consist of crushed diamond or bort. It shall be graded for size as specified in Table 1.

Detail Requirements

7. *Grade designations.* Grade designations and size ranges are given in Table 1. It is not intended that all manufacturers shall supply all grades listed in Table 1. In case intermediate grades are supplied the minimum and maximum sizes for any such grade shall be determined by interpolation between the minima and maxima of the adjacent higher and lower grades.

8. *Large particles and "fines."* No particles larger than the maximum size specified for the grade under grain size in Table 1 shall be present. Fines shall not be present in an amount numerically greater than 10 percent of the total number of particles in grade 40 and coarser, and not greater than 50 percent in grade 25 and smaller. Particles under 0.5 micron in size, which are not easily visible with the microscope, are to be disregarded. Fines shall not constitute more than 3 percent of the total weight.

9. *Impurities.* Grade 40 and coarser shall contain less than 2 percent by weight of impurities; a maximum of 5 percent total impurities is permitted in grades finer than grade 40.

Sampling and Inspection

10. *Sampling.* Lots of 100 carats or less shall be quartered to obtain a sample of the desired size. Lots larger than 100 carats may be thoroughly mixed and a representative sample of about 100 carats taken and quartered.

11. *Identification.* Diamond powder can be identified, and the presence of impurities can be detected by a competent laboratory familiar with petrographic methods of microscopic examination.

12. *Grain size.* A sample weighing 0.1 carat or less, obtained by quartering as described in paragraph 10, shall be placed on a glass slide and moistened with a drop of pine oil or other adequate dispersant, then thoroughly mixed and covered with a cover glass. Excess oil is pressed out and removed by blotting with absorbent paper. The slide is then placed under a microscope having a suitable ocular and objective. The sizes of the particles are determined as specified in paragraph 4 by measuring with a micrometer eyepiece or by means of dividers on a photomicrograph of known enlargement.

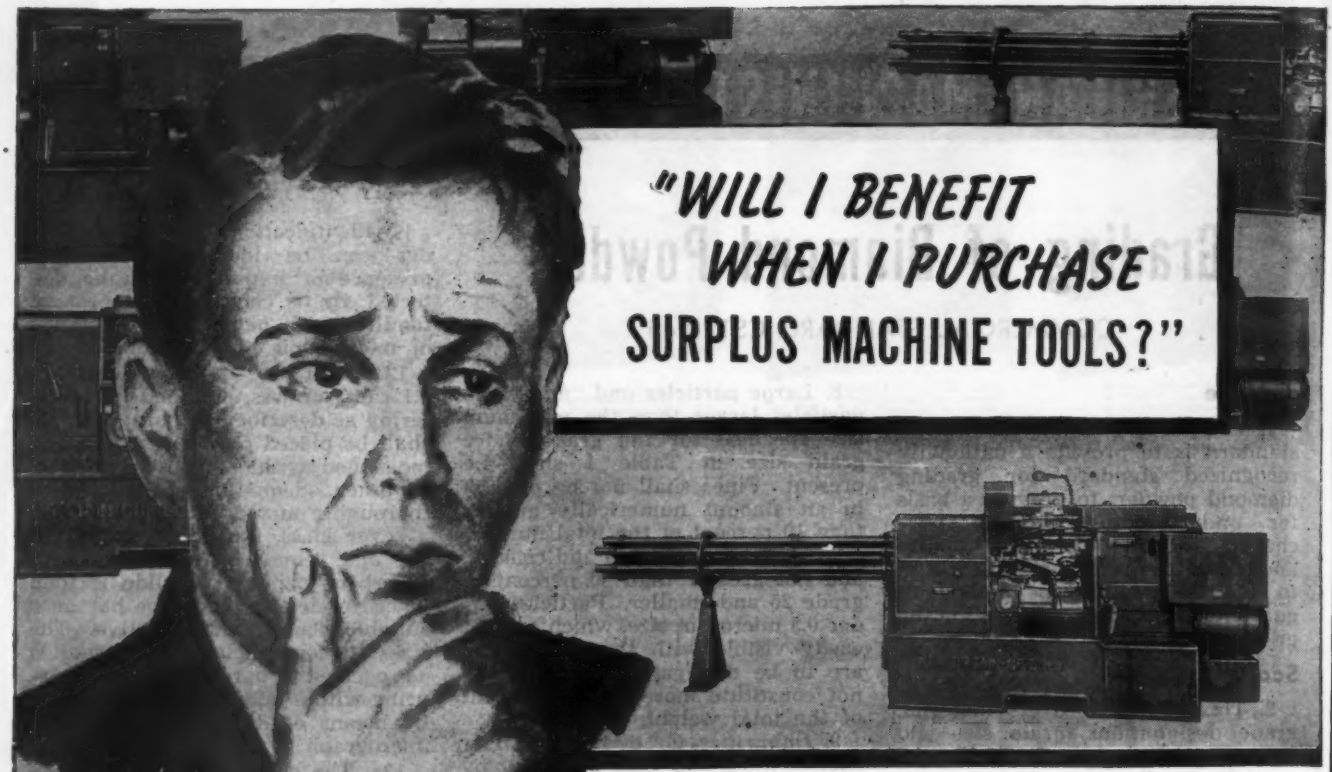
12a. The entire slide shall be examined systematically for particles larger than the maximum for the grade designated. If any particle is found that exceeds the maximum specified for the grade, the powder fails to meet the requirements of this standard. If the number and size of the fines indicate a possibility that the weight of fines represents as much as 3 percent of the total weight, the percentage by weight shall be determined by sieving or laboratory techniques.

TABLE I—GRADES OF DIAMOND POWDER

Grade designation[1]	Grain size (microns)		Sieve number (through)[2]
	Minimum	Maximum	
1	0	2	...
2	1	3	...
3	1	5	...
3X	0	6	...
6	4	8	...
8	6	10	...
8X	4	12	...
14	8	20	...
25	13	37	...
40	20	60	325
60	35	85	230
90	60	120	170
120	80	160	120
150	100	200	100
180	120	240	80
250	150	350	60
400	250	550	40

[1]Grades 1, 6 and 8 are narrow-range grades for exacting work in cutting and polishing fine diamond dies, sapphire bearings, etc. Grades 3X and 8X are wide-range grades desired for some purposes.

[2]United States Standard Sieve series. Sieve numbers are included for reference only. It does not necessarily follow that powders passing the sieve indicated for a grade will meet the grain size requirements of that grade, nor that powders retained on the sieve necessarily fail to meet the grain-size requirements.



"WILL I BENEFIT WHEN I PURCHASE SURPLUS MACHINE TOOLS?"

If you are contemplating the purchase of Surplus Machine Tools, it will pay you first to investigate particulars with the manufacturer. He alone can relate the entire history of the machine from original blueprints, tool specifications and service records . . . assuring your not buying a "pig in a poke".

War production has been gruelling and as a result many fine machine tools are due to retire, some should be rehabilitated in part, and others should be entirely overhauled. Take time to become acquainted with the machine's application, capacity, age and general condition. Consider the reconversion, replacement and maintenance costs. Then compare the total investment with the cost of a new model designed and tooled to meet your manufacturing requirements.

A plant adequately and properly equipped with efficient production machinery will be in a better position to cope with today's new developments in metallurgy and metalworking techniques. Costs will be lowered, and the product demand will increase which, in turn, will account for greater employment.

The ability of surplus New Britain-Gridley bar and chucking machines to continue to provide fast, accurate and economical peacetime production will be guided largely through intelligent redistribution and conversion. Let us help you. Consult with our nearby Sales-Engineer or, should you prefer, communicate direct.

NEW·BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

Manufacturers of Multiple Spindle
Automatic Bar and Chucking Machines
Mechanics Hand Tools • Shop Furniture

M-01016

Gaging Business

Nazi Tool Accumulation

Germany had over 1,000,000 machine tools to support her war machine, according to reliable reports from Germany. Many of these were stripped from industrial plants in occupied areas in Russia, France, Belgium, Czechoslovakia, Italy, and other nations. In any event, this accumulation of machines was equal to the 1,000,000 machine tools operated by American metalworking industries in 1940 (war needs have since lifted our national machine tool total above 1,700,000 units).

At its peak, the German machine tool industry is reported to have produced between 30,000 and 40,000 tools annually (U.S. peak output in 1942 total 307,000 units). To help increase her output, German machine builders developed some new small units, easier to make. However, many of the tools could not be shipped to the plants needing them due to transportation disruptions.

Since Russia had some 174,000 machine tools either stolen or destroyed by the Nazis, it is now retaliating by stripping Germany's industrial equipment, wherever it is located within its occupation area.

Tool Builders' Plans Set

With lend-lease and military orders cancelled, American machine tool builders are going about delivering reconversion tools and beginning to unfold their postwar plans. New machine tools are being announced by many companies, others are entering new lines of business to diversify their regular production, thereby protecting them against the wide fluctuations in business usually experienced by the industry. Most of them are seriously investigating foreign business prospects.

The industry is still concerned over the effect that the disposal of some 500,000 machine tools may have upon the domestic market. It is wondering whether many contractors in possession of government tools in their plants will exercise their 90-day options to purchase such items, now that they are no longer needed for war purposes. In the Detroit area alone, over $600,000,000 in machine tools and other equipment will be offered for sale by the RFC during the next few months. The automobile industry is ready to take 9,000 of the 60,000 government tools in that area.

Other Surplus Worries

Although the government has completed a partial inventory of its equipment, it has not yet made detailed studies showing the condition of such tools. There is little question but that the bulk of this equipment is less than five years old. However, much of it has been intensively used, and is actually older from the standpoint of wear.

A little mentioned factor further complicating the situation is the expectation that many privately-owned tools will soon be finding their way onto the used tool market. Such tools will probably be reconditioned by used tool dealers, and carry some operating guarantees. It is believed that this may force the government to recondition its tools perhaps via the facilities of tool builders or used tool dealers before offering them for sale.

Tapering War Output

Through August 15th, American industry had delivered $192,000,000,000 worth of weapons and supplies, and $10,000,000,000 was still scheduled for delivery through mid-1946, despite cancellations. September war production is scheduled to drop to $1,600,000,000 from July's $3,800,000,000. By December, the monthly output will decline to $800,000,000.

Shipbuilding is scheduled to be at one-third of its July, 1945 rate by mid-1946; ordnance output will be at one-tenth of its former rate; aircraft production will drop to one-seventh of the July rate.

Labor Force Diminishes

Labor unions continue to try to capitalize upon the eagerness of industry to return to peacetime production by threatening to hold up production via strikes unless wage increases are granted. Basic demand averages out to about 30 percent more to offset the loss of overtime involved in industry's return to the 40-hour week from the wartime 48.

According to the Department of Labor, August employment in manufacturing industries dropped 1,600,000.

After the initial rush to the U.S. Employment offices by laid-off workers to get enrolled for unemployment insurance, reports from major cities failed to indicate extensive job-hunting. Many observers believed it reflected the retirement of some workers from the labor force. Former housewives can go back to their housework and draw down unemployment compensation for many months.

Civilian Durable Goods Back—Despite strikes, price uncertainties, material bottlenecks, and various other handicaps, the nation's metalworking industries are pouring out consumers' durable goods of all types. Here, fully trimmed chrome and nickel postwar electric ranges roll off the production line at Edison General Electric Company's Chicago plant

Truman Proposes Tax Reductions, Employment and Other Legislation

WASHINGTON—In his message to Congress, marking its reconvening on September 6th, President Truman laid down a program of legislation designed to maintain employment and provide a stable economy and a high standard of living in the nation's transition from war to peace. The major points of this program were:

1. Speedy demobilization of armed forces no longer needed.
2. Some immediate tax reductions for 1946, and further cuts later on.
3. Provision for the stockpiling of strategic materials in which the United States is deficient.
4. Establishment of a single Federal agency for scientific research.
5. A program for development of natural resources and Federally-aided roads, public buildings, airports, and hospitals.
6. More liberal and clearer provisions for veteran aid.
7. Appointment of a single administrator to replace the 3-man Surplus Property Board.
8. Passage of the Full Employment Bill.
9. Legislation to help private enterprise to build from 10,000,000 to 15,000,000 homes in the next ten years, and continuation of Federal slum-clearance and low-rent housing.
10. Legislation providing for voluntary enlistments into the Army and Navy, plus continued inductions from the 18-25 age group.
11. An increase in the 40-cent an hour wage minimum.
12. A delay by Congress to proclaim the end of the war to preserve the government's war powers and war agencies.
13. Legislation to provide for $25 weekly unemployment compensation for twenty-six weeks, and to extend coverage of social security.
14. Legislation putting the Fair Employment Practice Committee on a permanent basis.
15. An extension of the U.S. Employment Service to June 30, 1947.
16. Salary increase for congressmen to $20,000 a year.

Legislation Discussed

Congress moved swifty to put some of these recommendations into action, and prepared to battle over others. First of all, the single surplus property administration was provided for, the job going to W. Stuart Symington. The other two members of the board Major Hurley and Edward Heller, were reported to have resigned.

The Full Employment Bill, and legislation increasing the weekly unemployment pay to $25 weekly for 26 weeks reached the floor of the congress. Work proceeded on legislation to provide for tax cuts, and several bills were in process for a single Federal research agency.

It is doubtful that Congress will hasten to proclaim the official cessation of hostilities, since many wartime controls and provisions will end at fixed dates beyond the "cessation of hostilities." For example, some of the tax increases in the last revenue act will expire at stated intervals "after proclamation of the cessation of hostilities; Selective Service would end on such a date; the Surplus Property Act will expire three years after "cessation of hostilities"; and so on. After the World War I armistice, the official declaration of the cessation of hostilities was delayed for several years.

German Machine Tools to Be Put on Display at Cleveland Ordnance

NEW YORK—Several German machine tools incorporating innovations not now in use in the American machine tool industry will soon be put on display by the Cleveland Ordnance Office, it was learned here. American technical men, just returned from a careful inspection of German industries report that very few startling developments were noted among German machine tools.

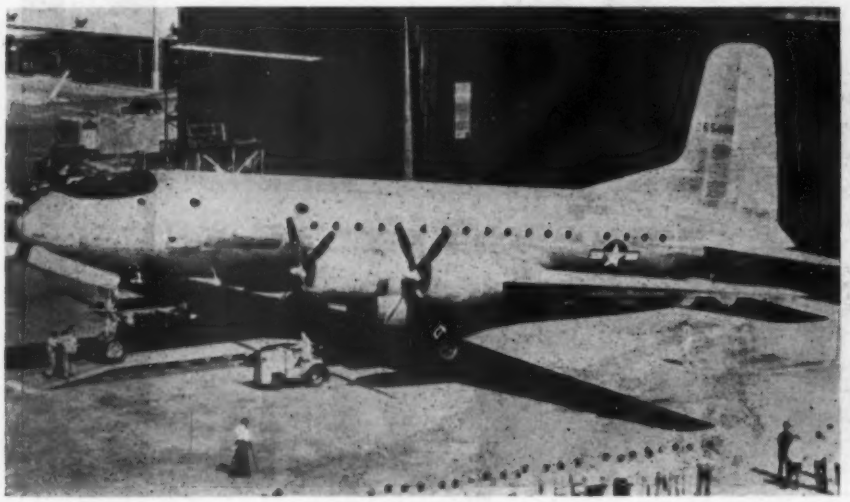
To help increase machine tool output, some very small units were turned out by the Nazis, but they never were able to push output above 30,000 to 40,000 units a year, it is estimated. To make matters worse, disrupted transportation prevented the shipment of finished tools from the builders' plants to the industries needing them.

With the addition of stolen equipment taken from invaded countries, it is estimated that Germany had over 1,000,000 machine tools working on war production program at the peak. Many plants had tools from many different nations.

Russia Retaliating

Observers further report that Russia is doing an effective job of stripping industries of their equipment. What Soviet troops cannot take away, they are moving out into the open to leave to the ravages of the elements. They have even stripped American-owned plants in their occupation area, and American companies are wondering what can be done about it. The possibilities of physicially recovering such tools are remote, but reparations may be asked. It is not merely a question of the missing tools, but the fact that such American plants will be delayed in getting back into operation again now that the war is over.

American tool builders and other manufacturers will be invited to inspect the German tools. Reports on German tool practice will be made available also in the near future.



New 108-passenger Luxury Liner—The Douglas C-74 Globemaster, called the world's largest land plane is shown before its first successful test flight. Now an Army cargo ship, the 77-ton plane will become a 108-passenger luxury liner. It exceeds the B-29 Superfortress in size with its 173-ft. wing span and its 124-ft. fuselage

Detroit Letter

Strikes Upset Reconversion

The UAW-CIO demands for a 30 percent wage increase bids fair to tie up the entire auto industry, unless Washington takes a hand. With the Ford plants closed down as a result of crippling strikes at suppliers' plants, and a strike vote due to be held at the plant of General Motors within a few weeks, the nation's reconversion timetable is being upset, and estimates of the nation's automobile output for 1945 will go by the boards.

Already, strikes in plants of component manufacturers have upset plans for public showings of new models. The Ford Co. had planned to display new 1946 cars in dealers' showrooms all over the country before the end of the month. Now they have postponed the showings indefinitely.

Hudson, also in production up to the time of the labor dispute in the Kelsey-Hayes plant, is not announcing for the present.

Other manufacturers are also marking time. And the period of temporary unemployment promises to stretch much farther than originally estimated. Even those car builders not involved in the disputes are watching them closely for indications of how the wind blows.

Kelsey-Hayes Strike Hurt

The labor factor has been a disturbing one in the reconversion period. During the war, sporadic flareups were held more or less in check by the no-strike pledge. With peace here, the pledge was dropped. The only strike officially sanctioned so far was the one against Ford of Canada. The Kelsey-Hayes tieup, with its wide ramifications, caused much discomfiture among the UAW-CIO chiefs. Thousands were made idle in Ford plants throughout the country because of it.

But union leadership has failed to end it. The local, in several votes, has been adamant and thousands are still idle at this writing. Ford plants resumed when other suppliers came to the rescue. But by September 14th, Henry Ford II, Executive Vice-president, Ford Motor Company, announced that the company would have to lay off 52,000 employees, because of the effects of the 29-day-old strike at Kelsey-Hayes Wheel Company. Ford pointed out that the company had produced fewer cars in three months, than it normally produces in three hours.

UAW Troubled Too

Under the surface is a seething that may come to the top with no warning. While this is not a propitious time to bring about a big tieup, observers feel it is in the making. Chrysler has agreed to hear the UAW's arguments, while not indicating in the least that it will yield. Ford is studying the demand and so is General Motors.

Inside the UAW, there is turmoil too. Walter P. Reuther, extremely able and vociferous, is said to be ready to oppose R. J. Thomas for head of the union. And that will be a battle.

Job Rise Indicated

Potentially, Detroit is sitting on the edge of a truly golden era. A report just completed by the Detroit Committee for Economic Development shows that the area has an opportunity to afford employment for more than 1,000,000 persons when reconversion is completed. The estimates are that 668,000 will be employed during reconversion and 911,000 in the post-reconversion period. It can go up as high as 1,083,000 if projected expansion is carried out. Between 336,705 and 403,616 men and women will be employed in auto plants.

The report showed that women will form a good part of the working population of the area. An increase of 75,000 over the pre-war employment of females is indicated, going to 204,000.

Auto Employment Upward

Reports to the still functioning War Manpower Commission seem to bear this out. The most recent survey shows that unemployment has almost reached its depths, barring the joblessness that may arise out of strikes. Even so, Federal action will probably keep such strikes relatively short.

Of 31 plants reporting to WMC, 13 have started to pick up employment; nine plan to retain what they have now for the next two months and nine still have some trimming to do but not much, provided the labor situation can be stabilized.

Pontiac Expanding

Optimism on the future outlook is in the air. Harry J. Klingler, general manager of Pontiac, has revealed plans for a huge expansion program which will boost employment from a pre-war peak of 11,000 to 16,000 and add 1,100,000 square feet to its plant area.

Klingler outlined plans for 500,000 cars in the first year. Part of the plans call for expansion of the foundry at an expense of more than $3,000,000, an increase from 800 to 1,344 tons of metal to be poured daily. The foundry was expanded only four years ago at an outlay of $1,000,000.

Kaiser At Willow Run

On the heels of his son's visit to Detroit, Henry J. Kaiser himself stopped in to look over the $100,000,000 Willow Run plant which he has publicly announced his intention of buying or leasing. To show his serious intentions, Kaiser brought with him engineering, financial and legal counsel.

For two days he conferred with his partner, Joseph W. Frazer, president of the Kaiser-Frazer Corp. and Graham-Paige Co. But he refused to make any public statements on his plans before departing for Washington, ostensibly to try to sell President Truman on Kaiser's personal reconversion plans.

The New Studebaker

Studebaker became the third company to announce its first postwar car, the Champion, little changed from the 1942 model. Dealers are expected to receive their first lines next month, the company stated.

Studebaker plans four body types in a variety of colors. Feature of the 1946 is a new grille with horizontal members extending full width across radiator and fenders. The engine is practically the same as pre-war and the one used in the Weasel. Aluminum alloy pistons, dropped in 1941, are back.

New springs, with improved action, is claimed by the company. They introduce oil-impregnated, full length inserts known as Flex-o-liners for smoother action. Shot peening has been continued for all spring leaves.

FORDS WILL HAVE RADIOS AND OTHER ACCESSORIES

DEARBORN, MICH.—Recent developments will make radios and hot water heaters available early in October for Ford passenger cars. Other accessories that purchasers of new Fords or Mercurys may get at their option governors, air cleaners, vanity mirrors, wheel trim rings, defrosters, spotlights and fender shields.

Small Steelworking Plants Seek Work; New Buying Jams Steel Mill Backlogs

PITTSBURGH—Many small miscellaneous steelworking plants which were born or expanded during the war are in urgent need of orders and they are seeking new business. Some of these small producers are making every effort to stay in their present businesses and avoid going back to the one they had before the war.

One striking example of this is represented in a group of automobile dealers who started machine shops or entered screw machine work during the war. Without exception, they wish to keep their new businesses, although some of them will also operate their auto dealerships. But others desire no part of the motor car industry, and they are scouring nearby states seeking employment for their machines as subcontractors in parts making or in assembly of peacetime products.

War cancellations have hit the miscellaneous iron and steel group hardest and employment has dropped accordingly, although the primary steel producers have been little affected. Pay-rolls have also dropped due to loss of overtime. But, overall, the employment trend in the steel industry is still downward, even though unskilled labor is needed.

Steel Demand Up

Steel demand is again accelerating. In the sheet and strip division, the heavy buying has created such a delivery situation that mills may allocate tonnage. It is reported that the possibility of a rise in steel prices had forced buyers to try to beat the increase by getting prompt delivery. Even companies busy with reconversion suddenly developed the idea of building up a peacetime steel inventory. When this trend had completely bogged down sheet schedules, buyers increased their pressure even further.

Sheet Mills Jammed

The auto industry is trying to get a substantial inventory of flat-rolled steel by the middle of December, when it expects to get really rolling on car production. This explains why sheet mills are fully committed through mid-December. Galvanized sheets are the most acute item in light flatrolled steel. In some cases, warehouses and jobbers are trying to buy a year ahead. Silicon sheets are also in heavy demand due to a large program in the manufacture of fractional horsepower motors for household machines and other items.

The plate market is recovering from the heavy cancellations which hit it with peace. Larger railroad equipment orders and even some ship business have brought some plate mills to the point where they are booked two months ahead.

Other Products

Structural shape mills are well booked through the end of 1945, and lengthening deliveries are expected as building increases. Bars can now be promised for definite delivery with cancellation bookkeeping out of the way. Small sizes are in best demand, but delivery dates on them are the longest. Wire and pipe are tight.

Lack of manpower is keeping some companies from instituting a 40-hour week in all their finishing mills. One integrated company reported that its new hiring was about equal to normal turnover, thus delaying plans for reduced working time. Continued payment of overtime with lucrative war business out of the way will affect industry profits.

85% of Coast Plant Operators To Buy or Lease; Expansions

LOS ANGELES—Forty-three eastern and midwestern manufacturing companies purchased property in Los Angeles county during the war, for the purpose of erecting plants. Of that number, 31 have announced plans calling for expenditures totaling $17,075,000 for real estate, buildings and equipment, and expect to employ 18,000 people at start of operations.

Hundreds of inquiries from nationally known manufacturers are on file in the Industrial Dept. of the Los Angeles Chamber of Commerce, and from them it is estimated another $50,000,000 or more will be invested and an additional 18,000 jobs will be created.

During the war, $450,000,000 in federal and private funds were expended in Los Angeles county for plants and 85 percent of war-time operators have indicated intentions of buying or leasing their plants.

Surveys in some of the Southern California aircraft plants indicated 90 percent of their new-resident employees planned or hoped to remain in Southern California permanently.

$25,000,000 in Dodge Plant Tooling Scrapped, 10,800 Tools to Be Sold

CHICAGO—About $25,000,000 worth of special tooling and fixtures will be abandoned or scrapped at the Dodge Chicago plant, as a result of a decision by a panel of Dodge, RFC, and industry representatives who inspected the tooling. Used in the production of some 18,413 B-29 engines, the tooling is owned by the army air forces which will leave it attached to machine tools in the plant owned by Defense Plant Corporation. It is estimated that about $1,000,000 will be saved for the government, by handling disposal of the fixtures in this manner.

Within 60 days, tools with this tooling affixed will be open for inspection at the Dodge plant to potential buyers. Purchasers will buy the tools on the basis of the Clayton formula, but will not pay for the tooling attached. They would have to strip the single-purpose tools and fixtures from the machines themselves, but would be entitled to any salvage realized thereon.

Tools Stored

Surplus machines not sold will be prepared for extended storage and at such time the special tooling would be stripped from the machines and sold at scrap. It was explained that the cost of reclaiming the special tooling would exceed its salvage value. The return to the RFC on scrapped tooling might be less than 1/10th of one percent.

The Dodge plant contains 10,800 machines.

UAW PAPER SAYS INDUSTRY WILL USE VETS VS. LABOR

DETROIT — Certain anti-labor employers are charged with planning to use veterans to "break the unions" and "depress wage and working standards throughout industry," according to the September 15th issue of the United Automobile Worker, official organ of the CIO-UAW. In one of its more surprising anti-business articles it states:

"Anti-labor employers have their job plan for veterans all ready: 1. Drastic slash in total number of jobs as compared with war years; 2. Make veterans feel they can only get jobs by taking them away from war workers through so-called 'super-seniority'; 3. Use veterans as a club to break the unions; 4. With union strength undermined, depress wage and working standards throughout industry—no job protection for anyone, veteran or non-veteran."

Washington Bulletin

WPB Folding

To all intents and purposes, the War Production Board will end most of its functions at the end of September. Its size will shrink to a skeleton force, primarily to give aid to firms seeking priorities for reconversion, to finish war histories of various WPB activities, and to wind up its operations.

The Commerce Department is scheduled to take over all the records and wartime information of WPB. But whether Commerce continues some of WPB's monthly reports, or resumes many of its prewar reports will depend upon its budget. Some Commerce officials say that they are unable to bring their staffs back to the pre-war level, let alone expand any units to carry on war-instituted activities.

Commerce will also take over most of the operations of the Smaller War Plant Corporation, except for its loan functions which will be continued by RFC. Wallace has wanted to put more emphasis on small business activities in Commerce, and the taking over of SWPC gives him his opportunity. One section of SWPC he expects to do a lot with is the research unit, which offered free help to small plants.

Lend-Lease End

The end of Lend-Lease by the United States also means the end of reciprocal aid arrangements with various countries. Some of them had been contributing more in reverse lend-lease (Belgium, for example), than we were contributing to them. Aside from that, it has ended arrangements for shipping rubber, tin, and other commodities here. Reports are that new arrangements will prove more expensive for the United States.

The halting of lend-lease shipments, pending new arrangements, is holding up Belgium and French machine tool shipments. More than that, it throws up into the air France's proposed lend-lease expenditure of $100,000,000 for machine tools, out of its total $2,575,000,000 program.

The upshot of international aid will depend upon the outcome of British financial negotiations with the United States.

Surplus Property Troubles

The reported resignation of Board members Heller and Hurley from the Surplus Property Board brings up the total of high officials quitting the surplus set-up to six. Previous resignees include Colonel Alfred E. House and Mason Britton, two former Surplus Property Administrators, former Senator Gillette, chairman of the Surplus Property Board, and Wesley Sturges, former counsel to the Board. Sole survivor is W. Stuart Symington, new chairman and single administrator of the board, and latest appointee.

To speed up sales of surplus tools and other equipment, the RFC has acted to eliminate the 30-day waiting period required until now before surpluses could be sold. RFC will launch a nation-wide general advertising program announcing the availability of all types of surplus equipment, so that it will not have to take individual time out to advertise separate surplus lots.

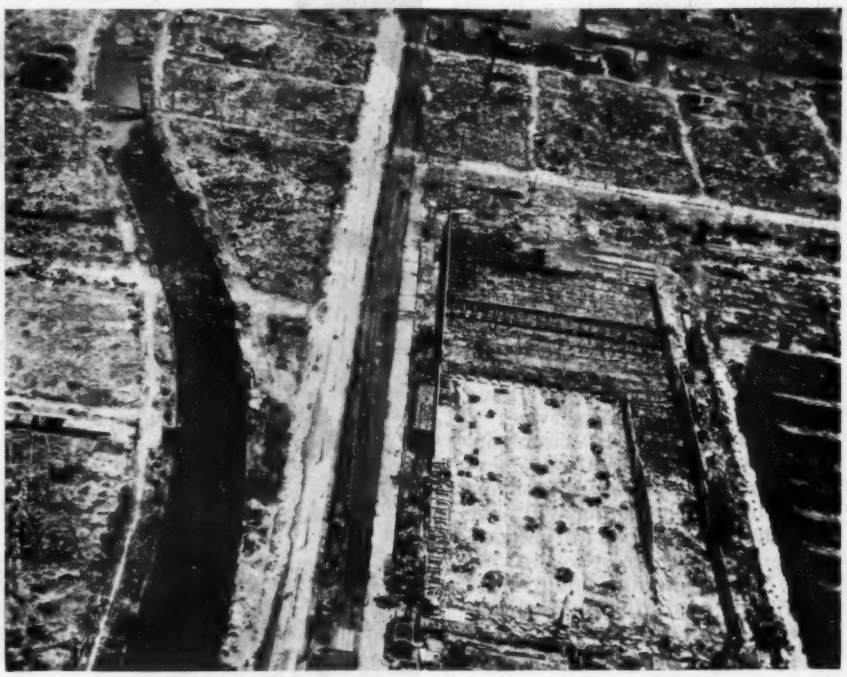
In cases where reconverting companies have required plants or tools, and continued operation and employment was endangered, appeals to the Surplus Property Board permitted the waiver of practically all red-tape and waiting periods.

There have been some complaints that RFC has held up returning applications by large companies trying to purchase over $1,000,000 worth of surplus equipment. Some firms were under the impression that the Department of Justice, which must approve such transactions, were responsible for the delay, but inquiry there reveals that it only takes from two to six days to process them. Large purchasers of surplus equipment will be interested to know that of 18 proposed transactions, Justice approved 17, involving $25,515,000 worth of surpluses. The one that was not approved, involved about $5,000,000 in machine tools and allied equipment, and it is reported that it is being resubmitted under SPB Regulation No. 6 with fair chances of being approved.

Postwar Tin Prospects

The Mead Committee is carefully studying the nation's postwar tin situation. It will try to determine whether or not the U.S. should continue operating its government-owned tin smelter in Texas; whether we should stockpile concentrates; whether we should continue buying Bolivian tin, or allow the British to corner again Bolivia's entire supply. It is recalled that after World War I, the nation's emergency smelters were put out of business when foreign interests cornered the high-grade tin ore supply.

Since the United States has practically no tin ore, although it is the largest consumer of tin in the world, it has been at the mercy of the International Tin Cartel. Various attempts to support a domestic tin smelting industry and to arrange for purchases of Bolivian tin have been destroyed by tin cartel members.



Atomic Bomb Raw Materials Government-controlled—On September 13th, President Truman issued an order barring the sale or other disposition of all government lands containing radio-active mineral substances. This aerial close-up of part of what was once the Jap city of Nagasaki after it was hit by the second American atomic bomb used in the war gives some idea of its destructive power. Remains of a large factory are on the right

New Buick Specifications Reveal Various Innovations

FLINT, MICH—New Buicks will be built in only two chassis at first, the "50" and "70" series. They will follow the same general design as 1942 models, but with new front and rear bumpers, front fender extensions reaching to rear fender, front parking lamps in fender, stamped radiator grille, die cast radiator ornament of new design, new body and fender mouldings, and accelerator pedal.

While the body and engine dimensions of each series remain unchanged, numerous other changes have occurred. Power operated window lifts will be installed as soon as they are available. Interior handles will be die cast instead of plastic with 4% aluminum in the zinc die castings instead of the 1½% pre-war requirement. The chrome plating specifications call, also, for an increase of 33 1/3% in the thickness of the plate. Pre-war cold rolled steel mouldings and escutcheons will be changed to stainless steel or brass, while pre-war lead antimony die cast small parts will now be zinc die castings.

Other New Features

Rear axle shafts will be "Tocco" hardened, while shot-blasting will be used inside the rear axle housing. The new cylinder finishing, by Excello, is precision bored, then honed and finally treated with a lubrite coating which prevents scuffing. In the new water circulating system, the water must pass around the cylinders to the rear of the block and into the head, returning through the full length of the head to the radiator.

Other features include: aluminum pistons and single or dual type carburetor, which were used in 1941; the rubber hinge on the accelerator pedal is new as are ventilated filler caps on the battery. These will be available in the three body styles which include a two to four passenger convertible coupe, six passenger two-door and four-door sedans.

A.S.M. OFFERS REFRESHER COURSES FOR VETERANS

CLEVELAND—Refresher courses for returning veterans formerly in the metal industry will be offered free under a program adopted by the American Society for Metals. The objective of the courses will be to bring the veteran up-to-date on all developments and processes pertaining to his particular field that have taken place during his service.

According to W. H. Eisenman, secretary, the program will operate through the Society's 68 chapter groups. Each chapter will have a committee composed of experts in the field of interest to the veteran. The veteran would meet with these men in individual personal conferences, as often as necessary to bring him up-to-date on his profession.

Requests for such instruction should be addressed to W. H. Eisenman, National Secretary, American Society for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio, who will then refer them to the nearest ASM chapter.

Detroit Plants Turn Out Household Equipment—Swift reconversion brought back assembly line output of household products at these Detroit plants. From top to bottom: Electric irons are shown at the final assembly point at the American Electric Heater Co. plant; radios replace land mine detectors at International Detrola Co.; and kitchenware gets final inspection at Stainless Ware of America plant, formerly making plane and tank parts

773,779 Machine Tools Shipped During War; 1942 Record Total at 307,186 Units

NEW YORK—From the beginning of 1942 through June, 1945, 773,779 machine tools were shipped from the plants of builders, according to an analysis by AMERICAN MACHINIST of War Production Board data. These shipments alone are equal to 45 percent of the total number of tools operated by the nation's metal-working industries, or 1,711,137 tools.

It is estimated that 18 percent of the dollar value of shipments during the war went for export. But since the unit value of tools exported, chiefly to Great Britain and Russia, was higher than that for the average tool for domestic use, it is likely that the actual number of tools exported approximated between 10-15 percent of the total units shipped between 1942 and the first half of 1945.

Excluding exports, these figures indicate that there are in the United States today over 600,000 tools less than 3½ years old. Since most of these tools were purchased by the government for war purposes, many of them will eventually be available among surplus items.

Lathe shipments, totaling 233,535 units, comprised one-third of the tools turned out during the period covered in the accompanying tabulation. Grinding machines comprised the second large groups with a total of 137,864 units shipped, while the third largest group, drilling machines, came to 121,611 units. These relationships are in line with the national status of these groups from the standpoint of units used in metal-working industries.

Depreciation in the form of actual wear and tear during the war years is actually twice as great as the indicated ages of these tools. Thus, the 307,186 tools produced in 1942 are probably closer to six years old, from the standpoint of wear, than their indicated actual age of three years. This slightly changes the over-all picture.

Torpedo Plant May Reopen

CHICAGO—The $10,000,000 torpedo plant at Forest Park is expected to reopen soon, manned by civil service employees. Before its shut-down on August 20th, 6,000 persons had been employed at the plant. It had been operated for the navy by Amertorp Corp., subsidiary, American Can Corp.

MACHINE TOOL SHIPMENTS BY NUMBERS OF UNITS 1942-JUNE 1945

TYPES	Total 1942 Shipments	Total 1943 Shipments	Total 1944 Shipments	Total Jan.-June 1945 Shipments	GRAND TOTAL
Boring	9,697	7,278	3,070	1,702	21,747
Broaching	1,007	802	416	246	2,471
Drilling	47,654	41,581	21,944	10,432	121,611
Gear Cutting and Finishing	6,435	6,186	2,683	1,179	16,483
Grinding	54,009	52,810	21,687	9,358	137,864
Lathes	88,878	80,196	43,209	21,252	233,535
Millers	47,565	30,819	10,975	5,095	94,454
Planers	981	618	344	200	2,143
Miscellaneous	50,960	45,559	31,878	15,074	143,471
Total Yearly Shipments	307,186	265,849	136,206	64,538	773,779

Source: War Production Board

News Briefs

Navy Termination Timetable

WASHINGTON—The Navy announced that if contractors will present their termination claims by October 15th, it will try to have them reviewed by inspectors of material and forwarded to the contracting officers by November 15th. Contracting officers will try to make final settlement within 30 days after they receive the claims. Of the 50,000 contracts cancelled since V-J Day, it is estimated that 15,000 will involve claims. The Navy has a staff of 6,000 to work on terminations.

Lincoln Writes Truman

CLEVELAND—The adoption of an incentive system similar to that at the Lincoln Electric Company was proposed by James F. Lincoln, president, in a letter to President Harry S. Truman. Mr. Lincoln pointed out that his company's incentive system has produced: (a) No strife; (b) Continuous employment; (c) Steady income; (d) More Jobs; (e) More pay; (f) Wider markets through lower costs; and (g) Financial stability.

Increasing Amortization

WASHINGTON — War contractors can shorten their amortization period for "emergency" facilities covered by Certificates of Non-Necessity, by applying to WPB for a certificate of Non-Necessity. Such a certificate would enable them to completely write off emergency facilities from the time of their construction until the date they have received a certificate of Non-Necessity, instead of carrying out the amortization over the five-year period allowed under the law. The only other way in which depreciation might be reduced below the five-year period would be if the President proclaims that the "Emergency Period" has ended.

Plant Clearance Status

WASHINGTON—According to the Office of Contract Settlements, some 5,816 requests for clearance of termination inventories were completed in July, as against 7,399 requests received during that month. At the end of July, 7,046 requests were still pending, of which 402 involving inventories worth $13,283,000 were pending over 60 days. During July, 1,312 requests to clear government-owned plant equipment from contractors' plants were completed, as against 1,790 received. At the end of the month, 1,556 requests were still pending. Only 26 of the pending requests had been on hand over 60 days, and 14 of these contractors had waived the 60-day clearance privilege.

Labor Using Reconversion Urgency to Press Its Demands

Most unions seeking 30% rise in basic wage rate to offset shrinkage of work-week from 48 hours to 40. Unless management concedes, it faces strikes and reconversion delays

NEW YORK—By no means the least of the many problems facing management in its reconversion planning is uncertainty over labor relations. Future policy regarding production, prices, and long-range industrial programs are closely tied to the dual questions of how secure company relations with workers will be now that the war has ended, and just how much is going to be required financially to pay for labor costs.

The present situation is a new one as far as labor relations are concerned. If past happenings could be a guide, then the present conditions of rising unemployment and a surplus of workers would be accompanied by declining wage rates and a general weakening of organized labor's position in industry. But today neither of those trends is evident.

Labor Militant

The situation is an anomaly: While there is a steady climb in the roll of jobless workers, there is an upward movement in wages; while there is unemployment, there is no lessening in the militancy and the strength of unions.

The reason fundamentally is that the war years have seen a potential buying power built up for a wide variety of consumer products—automobiles, washing machines, electric refrigerators, on down the line through tricycles and toys, clothing, textile products, and so forth. With the war ended, those products can be made available now for consumers who have the money and the pent-up desire for them.

Thus, companies which can get products to distributing agencies first stand to cash in, and heavily. Knowing this, management is reluctant to chance labor tieups which might cost it valuable markets. It is inclined, if possible, to buy time.

Studebaker Pay Rise

Studebaker, with labor relations unusually sound for the turbulent auto industry, readily agreed to boost its wage scale 12½c an hour and to meet for its United Auto Workers (C.I.O.) employees any larger pay increase which U.A.W. wins for the auto industry. Subsequently Studebaker was able to announce that its first automobiles would be in the hands of distributors early in October.

The outlook is not at all bright for other less-foresighted automobile producers which are now being asked to negotiate with U.A.W. on the basis of 30% increases. Undoubtedly they would welcome an arrangement such as Studebaker has made, but there is no such an easy way out of negotiations for the major companies.

The same situation exists in every other industry. While many wartime predictions were that industry would move into a union-smashing campaign as soon as the war ended, the fact is that labor still is holding a strong hand. It can determine whether a company can reconvert speedily enough to enter a competitive field with an advantage, or a disadvantage.

Hence what labor is asking today is significant.

Basic 30% Raise

In the important field of wages, the demands are centering pretty much about a 30% increase. The U.A.W. has asked for that amount, and so have the C.I.O.'s Farm Equipment Workers and Rubber Workers. Phillip Murray's Steelworkers are demanding 25c an hour more from 86 basic steel companies, and ultimately will extend that demand—which amounts to 32% more for workers at the minimum wage of 78c an hour and about 20% more on an average for all workers—to the entire steel industry. C.I.O.'s Textile Workers want at least 27½c more for an hour's work; A.F.L.'s Machinists are after 30% more, and the Railroad Brotherhoods want either $2.50 more pay daily or a 25% increase.

While these figures have a worried management poring over cost sheets, they are only the beginning of labor demands which would be reflected in profit and loss statements. Vacations with pay, additional paid holidays, health and hospital insurance, and wage guarantees are a part of bargaining demands of many unions; as such they are subject to compromise, but out of them certainly will come some additional costs to management.

All of these direct or indirect wage demands add up to one thing: A 40-hour workweek paycheck equal to what labor has been getting in wartime's overtime-padded 48-hour week. That's where the 30% figure comes in. If the straight time hourly rate is increased that amount (say from $1 to $1.30 an hour) labor can get the same pay for 40 hours work that it has been getting for 48 hours.

Is Raise Earned?

Management, however, is inclined to think of payroll in terms of productivity, and of what the use of labor earns for management. The contention in negotiations is going to be that industrial wages—without further adjustment—are much higher than prewar, while actual productive value has made smaller increases. Some further wage gains (8% or 12% are mentioned frequently) are considered sound, but a line of resistance is being drawn there. Whether it can stand depends largely upon whether management is prepared for a labor dispute during the importance reconversion period.

Probability is that there will be considerable compromising, with payroll boosts not as modest—and

Studebaker's Wage Boost Assures New Cars Soon—Studebaker was able to announce that its first cars would be in the hands of dealers shortly after the company granted its employees a 12½c.-an-hour wage boost, and agreed to meet any further pay increases UAW wins from the auto industry. The new Studebaker, shown here, will be powered by the Champion six-cylinder engine, which stood rigid war tests running the famous Weasel

conservative—as management is willing to give, nor as large as labor desires.

If compromises come during reconversion, eventually — when wheels begin turning at new peacetime speed—the issue of wages will be subject to re-examining.

Before that time, management hopes, there will be some form of successful management-labor machinery set up to handle disputes: Recently representatives of major unions and business organizations were called together by Secretary of Labor Lewis Schwellenbach and Secretary of Commerce Henry Wallace, and were able to agree that the time is ripe for consideration of a peacetime successor to federal controls over disputes—primarily, to the National War Labor Board.

Labor, Industry Meet

The preconference meeting set up a group of subordinates to outline proposals for an agenda for a management-labor conference to be held in Washington either Oct. 29 or Nov. 5. From discussions in this group it became apparent that sentiment was dividing between a new labor relations agency—a sort of watered-down NWLB—in the Dept. of Labor, and a voluntary industry panel which would advise and assist in labor disputes. Cardinal issues to be settled at the full-dress conferences will include that of sanctions powers for whatever type of agency is set up, and whether unions and management should face equal contract responsibilities.

But strikes are occurring at a greatly accelerated rate. In mid-September the daily average of striking workers was running well above 100,000. In most instances, however, these strikes were not directly supported by the big international unions.

There was, for instance, a wave of walkouts in automobile parts plants in Detroit, involving U.A.W. workers. Yet U.A.W. top leadership was opposed to them as a threat to reconversion jobs of thousands of U.A.W. members. Because of internal union politics it could not act against the strikers with a strong, unified leadership, but it was exerting all the pressure it could.

Locals at Fault

This was the situation: Local unions in the parts plants, knowing that the rush was on to get cars into production, and that the parts float (stock) was low in assembly plants, seized the opportunity to press for economic gains which might be more resolutely resisted under normal production conditions.

International officers opposed the strikes because they placed the onus of reconversion delays on organized labor, and raised in major companies a stumbling block to wage negotiations which were scheduled to begin in the month.

Other segments of management may see in this an indication of what they may expect: Wildcat pressure strikes from small groups—afraid that unless they act immediately their opportunity for labor gains will be lost—but no major all-out strikes by major international unions until reconversion is completed, and until after the management-labor conference.

Canadian Shipyards to Remain Busy, As Most Other War Work is Cut Back

MONTREAL—Canada is hopeful of something approaching full employment as soon as reconversion is completed, according to Reconstruction and Supply Minister Howe, in a report on the wind-up of war business. Mr. Howe pointed out that encouraging employment reports have been reaching his desk, but that it has taken some time to switch war workers to peacetime jobs. This is explained as the reason why there are some unemployed in Canada.

Mr. Howe reported that war production on a reduced scale will continue through the end of 1945 with the emphasis on shipbuilding. Shipyards will provide work well into 1946, completing four destroyers for the Canadian Navy, and many ships on order for the British. Work will continue on 11 transport ferries, 5 minesweepers, 6 maintenance ships, and some smaller craft. Two floating drydocks and 45 transport ferries were cancelled.

32,000 Shipyard Workers

This shipbuilding activity is spread over some 15 yards from Vancouver to Halifax, and is separate from conversion and repair jobs as well as certain peacetime construction. Some 32,000 persons were still employed in Canadian shipyards on September 1.

Aircraft production was cut to the bone with peace, with most of the Dominion's orders from Britain cancelled. One R.C.A.F. order is continuing. American orders for Curtiss Dive Bombers and for PBY parts were cancelled. However, the building of 70 Douglas transports for Canadian account is being continued at Montreal. Over 20,000 workers were laid off from plane plants in the Toronto area.

$114,000,000 Auto Cut

In the automotive vehicles for war category, all maintenance parts orders were cancelled on VJ Day. War vehicle production has either been cancelled or is about to be cancelled by now. Spare parts contracts amounted to $26,000,000 and vehicle contracts (for 57,000 units) were valued at $88,000,000, meaning total cancellations of $114,000,000 in this industry.

Ammunition production is continuing at a greatly reduced rate. Some gun production has not yet been cancelled, and about 2,000 persons are working on turning out 25-lb. and 5.5 shells and grenades. The latter output is expected to continue for several months, at least.

Middle East Company Formed To Handle Trade in That Area

CLEVELAND—Dan T. Moore, former Regional Administrator of the Securities and Exchange Commission and executive assistant to United States Minister James M. Landis when he was United States Economic Director in the Middle East, announced September 7 the formation of a new corporation, The Middle East Company, to engage in the export and import business between the United States and the 24 countries of the Middle East including Egypt, Turkey, Iran, Palestine, Iraq, Syria, Lebanon, Saudi Arabia, Ethiopia, the Anglo-Egyptian Sudan, Greece, Cyprus, the Somalilands and Eritrea. Mr. Moore heads the new organization as president.

James M. Landis will be chairman of the board of directors of The Middle East Company while continuing his active post as Dean of the Harvard Law School. Eliot Ness is vice president and treasurer of The Middle East Company, and H. Wardwell Howell, recently connected with the War Department and the Foreign Economic Administration, is vice president in charge of Middle Eastern operations and will head the company's principal office in Cairo, Egypt.

James C. Gruener, Cleveland attorney, will be secretary and general counsel of the company.

Ohio Corporation

The Middle East Company, an Ohio corporation, was formed for the purpose of aiding American manufacturers in building up markets for their products among the 80,000,000 people of the Middle East. The Middle East region has been greatly enriched by the war, but shipping shortages have prevented it from importing its normal demands for commodities for the last five years. In addition, great opportunities have been opened up by virtue of the fact that the former heavy German, Japanese and Italian trade with this area has been eliminated.

Auto Industry Delivered About 29 Billions in War Products to Allies

DETROIT—The Automotive Council for War Production is being disbanded October 1, and the Automobile Manufacturers Association, which it displaced for the duration, will again come into existence. The Council's statistical staff, winding up the figures on war work, showed that the auto industry had delivered nearly 29 billions in war products to the United States and its allies up to date.

By-products the industry delivered include $11,244,857,000 in aircraft assemblies and parts: $8,591,143,000 in military vehicles and parts; $3,781,356,000 in tanks and parts; $1,951,658,000 in marine equipment; $1,589,841,000 in guns, artillery and parts; $907,535,000 in ammunition and components; and $903,610,000 in miscellaneous items for a total of $28,970,000,000.

Prices Constantly Cut

George Romney, managing director of the Council, pointed out that the dollar value of the goods did not represent an accurate picture of the achievements; the industry shaved prices constantly during the war. In terms of units, the tabulation is still incomplete. The known portion of the record follows:

Carbines	3,386,570
Machine Guns	1,439,810
Anti-aircraft Guns	156,100
Others	848,500
Total Guns and Artillery	**5,830,980**
Aircraft Engines	418,000
Tank Engines	161,230
Marine Engines	166,450
Total Engines	**745,980**
Tanks	48,750
Amphibian Tanks	5,100
Self-propelled Artillery Tank-Type	23,750
Other Guns, Carriages and Armored Cars	113,560
Total Combat Vehicles	**191,160**
Military Vehicles	2,600,000
(includes 659,031 jeeps and military trailers)	578,000
Complete Airplanes	
Bombers	16,035
Fighters	5,800
Total	**21,835**
Gliders	4,290
Torpedoes	2,000
Buzz-Bombs	2,000
Marine Gyrocompasses	5,500
Amphibious Jeeps	12,777

Besides having produced all of the military vehicles for the armed services, the industry's share of the nation's combat vehicles (tanks, self-propelled guns, armored cars, etc.) was approximately 80% of the total.

WPB WILL COMMANDEER IDLE SURPLUS EQUIPMENT

LOS ANGELES Government-owned machinery in idle war plants will be "commandeered" by the WPB to assist in disposing of it to plants where it will serve in production of civilian goods, Louis M. Dreves, WPB deputy regional director told members of the Los Angeles Chamber of Commerce recently. He requested manufacturers planning consumer production to notify his office of their needs for equipment and, where possible, to cite idle equipment they wish to obtain. The WPB office will resort to its authority to commandeer such equipment, if such is necessary, to make such idle machines available to plants which can put it to work immediately.

U. S. Air Compressor Acquisition Brings Schott Holdings to 16

CLEVELAND—The purchase of the United States Air Compressor Company of Cleveland, in a million dollar deal, by the Schott family has increased their growing list of factories and holdings to sixteen. A scrambled picture is even further confused by this latest acquisition for those who are attempting to form a pattern for the scattered buying of the five Schott brothers.

Holdings, as of the present, include more than a dozen plants which turn out parts and finished products for the automotive, aviation, wood working and building industries, not counting the automobile and aviation dealer franchises held in the names of various Schott companies and partners.

Assets Over 8 Millions

Walter E. Schott, 44, eldest of the five brothers, started the family's accumulation of wealth 24 years ago as an auto dealer. Their present visible assets are well in excess of eight million dollars.

In 1927, with profits from the sale of cars, he threw the automobile business into an uproar throughout the United States by staging bargain sales of new but outmoded cars in practically all of the major cities in the country, violating all accepted practices for the sale of automobiles. Ten years later he and three associates made a $2,000,000 investment that enabled the Willys-Overland Company to reestablish itself.

Harold E. Schott heads the Columbia Axle Company in Cleveland and already has that company fully converted from all-out war work to peace time industry and ready to supply parts for the automotive and aviation industry. Alfred Schott is in active charge of Eagle Manufacturing Company in Cincinnati; Joe Schott manages the J. A. Fay & Egan Company; Milton, an attorney as well as the youngest, helps look after the legal matters for the family. The two sisters take their share of the responsibilities. One Mrs. Luckey, is in Buffalo and another, Mrs. Marie Geiringer, manages the real estate holdings in Toledo as well as being the Toledo distributor for the Cincinnati Time Recorder Co.

Other Interests

In addition to the firms already mentioned, the Schotts have either an interest in or own such companies as the Heinz-Munschauer Company of Buffalo with a branch factory in Cleveland, King Welding Company, Betts Street Company, Standard Electric Range and Manufacturing Company, Greaves Machine Tool Company, and numerous automobile dealer franchises.

According to Walter Schott, there is no intention to weld all of the Schott companies and investments into an overall holding company. Rather, he sees considerable advantage by having each enterprise a separate concern. They pay cash from their own well-stocked bank accounts for property they acquire and the stock of all Schott companies is closely held by family members except where they have allowed key men in a few of their industries to participate.

Navy Suggestion Program to Go On; 17,000 Ideas Adopted

WASHINGTON—In announcing today the continuation of the Navy's Beneficial Suggestion Program as a peacetime measure, Under Secretary of the Navy Artemus L. Gates stated that the first year's savings on more than 17,000 adopted ideas submitted by civilian employees exceeded $66,000,000 during World War II.

These 17,000 suggestions for which awards were paid were submitted by workers at Navy yards, air stations, ammmunition depots, torpedo stations and various other types of shore establishments operated by the Navy. They ranged all the way from skillfully designed tools, jigs and fixtures used in streamlining production to new and ingenious methods of construction and repair. In addition, several new instruments were invented by Navy technicians outside of their assigned duties which played an important part in tactical operations and training programs.

Names in the News

A. C. Monteith

A. C. Monteith has been appointed assistant manager of headquarters engineering of Westinghouse Electric Corp. and will direct the department's activities during the absence of **C. A. Powel,** who has been assigned to the military government of Germany. Mr. Monteith, manager of the industrial engineering department since 1941, has also been appointed director of education for Westinghouse.

J. S. Murray was recently appointed Pittsburgh district manager for the Alliance Machine Co., Alliance, Ohio. He was formerly chief electrical engineer for Follansbee Steel Corp. where he had been employed since 1919.

F. B. Millham has recently been appointed director of the General Industrial Division, War Production Board, succeeding **William M. Haile,** who has resigned to return to the industry.

Ralph E. Lee, recently discharged as a captain from the Army Air Corps, is now manager of the export department of the Trane Company, LaCrosse, Wis. Captain Lee left the company's general sales department in March 1942 to enter the service.

Carl A. Ilgenfritz has been appointed vice president in charge of purchases of Carnegie-Illinois Steel Corp. with offices at 434 Fifth Ave., Pittsburgh, Pa. Mr. Ilgenfritz recently resigned as manager of purchases and raw materials of Republic Steel Corp. to assume his new duties.

James H. Rasmussen, general sales manager of The Crosley Corporation's manufacturing division has resigned after being associated with the firm since 1941.

H. A. Stevenson, formerly a lieutenant colonel on the General Staff Corps, Army Service Forces, has returned to his former job as distributor in the Michigan territory for the Baker Industrial Truck Co., a division of The Baker-Raulang Co. Cleveland, Ohio.

Walter Parrish has been named chief engineer of the Rogers Diesel and Aircraft Corp., New York. For the past five years he has been executive engineer for the Superior Engine Div., National Supply Co.

Sigfried A. Olson, Jr. has been named industrial manager in Stockholm, Sweden for the Brown Instrument Co., Philadelphia division of the Minneapolis-Honeywell Regulator Co. He has been the Brown Company's New York sales engineer for the past nine years.

E. D. Wacker, for the last eight years general sales manager of the C. J. Tagliabue Division, Portable Products Corp., Brooklyn, N. Y., has been named general manager of the division. Mr. Wacker has been associated with the division for the past 22 years.

E. D. Wacker

G. E. McGuire

George E. McGuire has recently been named director of foreign sales of The Carborundum Co., Niagara Falls, N. Y. He has been with the firm since 1911 and for the past nine years has been sales manager of the export department.

Kenneth H. Gayle Jr. has been elected vice president in charge of northern division sales and exports of The Ingalls Iron Works Co. and its subsidiary, The Steel Construction Co. Mr. Gayle has served as northern division sales manager since 1939 and export manager since early last year.

Andrew G. Haley, founder and president of the Aerojet Engineering Corp., Pasadena, Calif., has resigned as president and director to resume his law practice in Washington, D.C. The company has been active, during the war years, in the development of jet propulsion and rocket power.

Harry A. Winne, vice president in charge of engineering for the General Electric Company's apparatus department, has been appointed vice president in charge of engineering policy for the entire company.

Wilbur F. Campbell recently resigned as assistant to the president of the Pioneer Engineering and Manufacturing Co., Detroit, Mich. to re-enter private practice.

W. E. Hoard

William E. Hoard has been appointed area sales manager of the San Francisco area for Western Gear Works and its associate, Pacific Gear and Tool Works. A former assistant to the sales manager of Western Gear Works three West Coast plants, he has served in various executive positions since 1942. Prior to joining Western Gear he was with Westinghouse Electric & Manufacturing Co.

Ralph G. Rogers has joined the American Central Manufacturing Corp., Connersville, Ind., as works manager. Factory manager for Republic Aviation Corp., Evansville, Ind., during the war years, Mr. Rogers had previously been superintendent of Servel, Inc.

H. J. French has resigned as assistant director for raw materials and facilities of the Steel Div., War Production Board, Washington, D. C. He has resumed his duties as assistant manager of the development and research division of the International Nickel Co., New York, N. Y. Mr. French has been associated with the WPB since early 1942.

Russel A. Schultz has joined the Robbins Engineering Company, Detroit, Mich., as vice president in charge of engineering and sales and **J. H. Hagen** has been elected vice president and factory manager. Mr. Schultz was formerly with the Chevrolet Motor Div., General Motors Corp. for 21 years, while Mr. Hagen has been at Robbins since 1929.

Raymond H. Gaver and **Jonas D. Bigelow** have been appointed chief engineer and development engineer, respectively, of the newly established Railway Equipment Div. of The American Welding & Manufacturing Co., Warren, Ohio.

General Motors Corp. has appointed several new resident managers in its Fisher Body plants in the East, Middle West and South. The appointments include: **L. P. Cramer,** at the Janesville, Wis. division; **E. J. Hanson** at the Ternstedt Trenton, N. J. division; **C. E. Hoehn** for the Tarrytown, N. Y. division; **H. B. Lowendick** at the Atlanta, Ga. division; **M. J. Olson** in the Baltimore, Md. division; and **S. J. Sabourin** at their Grand Blanc tank plant.

BUSINESS ITEMS

B. J. Brugge

The Lincoln Electric Company recently opened a direct factory branch sales office in St. Louis, Mo. The new branch, under the direction of **B. J. Brugge** as welding engineer and district manager of sales and service, is located at 4427 Manchester Ave. Mr. Brugge was granted a leave of absence in 1935 to assist the application of electric welding in the Near East. After two years in Iran, he spent some time in the British Isles as welding consulting engineer for British and Scottish firms.

The **Heppenstall Co.**, Pittsburgh, Pa. is building and equipping a new research laboratory opposite the company's plant. **James C. Hartley,** director of research, will be in charge of the new laboratory which will be devoted exclusively to the development of new products and the improvement of current items.

General Motors Corp. is making plans for the erection of a manufacturing plant near Elyria, Ohio to produce products similar to those made in the Syracuse, N. Y. plant before the war. The Syracuse plant will be turned over to the Harrison Radiator Div. when the Elyria plant is ready for occupancy.

Ellinwood Industries, Ltd. with headquarters in Los Angeles, Calif. has recently been formed by **Ray Ellinwood.** Until recently, Mr. Ellinwood was president of Adel Precision Products, Inc., a concern which he founded in 1937. The new firm will produce and sell materials and machines in the agricultural implement, marine equipment, business machine and home product field, especially.

The Cooper Alloy Foundry Co. has established a sub-division devoted exclusively to precision casting of small intricate parts. Known as the **Precise Casting Corp.**, Div. of The Cooper Alloy Foundry Co., it is now operating at 123 Van Buren St., Newark, N. J.

Robert Hetherington & Son, Inc. Sharon Hill, Pa. has recently opened a West Coast office at 5607 W. Adams Blvd., Los Angeles, Calif. Sales in the West Coast area will be under the direction of **C. E. Fisher** while Hetherington engineering in that area will be under the direction of **L. E. Massie.**

Allegheny Ludlum Steel Corp. has approved a $5,000,000 postwar research and production expansion program. An ultra-modern laboratory and related experimental and pilot plant equipment will be built at company headquarters to intensify studies of the structure, melting, processing and further development of high alloy steels. At the West Leechburg, Pa. plant a cold rolling mill for rolling stainless and silicon strip steels will be constructed.

The **Greenleaf Corp.**, recently incorporated, will have headquarters in the Penn Building, Pittsburgh 21, Pa. The service of the firm will include not only national distribution of products for manufacturers who have no national distribution of their own, but also advertising and promotion for such products, warehousing facilities, and research and engineering facilities for establishing and maintaining standards, testing, etc. The corporation may also, under its charter, manufacture and distribute products of its own. **Walter J. Greenleaf,** president of the Walter J. Greenleaf Co., will serve as chairman of the board and president of the new firm.

Robbins Conveyors Inc. and its affiliate, **Hewitt Rubber Co.** have opened a new office in the United Carbon Building, Charleston, W. Va. **R. U. Jackson,** who has represented Robbins in the territory for 15 years, will be in charge of the office.

Westminster Machinery Sales Co., Ltd. was incorporated recently to engage in machinery distribution and manufacturing business in British Columbia, Canada. The company offices are at 503-6, 470 Granville Street, Vancouver, B. C.

The Geometric Tool Company Div. has consolidated its Detroit office with the Detroit plant and office of the **Greenfield Tap and Die Corp.**, 5850 Second Blvd., Detroit 2, Mich. **M. Glen Hook,** former manager of the Geometric office retired on September 1, while **W. J. Randall** will continue as field engineer at the new address.

The Titan Metal Manufacturing Co., Bellefonte, Pa. has created an International Div. with headquarters at 70 Pine St., New York, N. Y. to engage in foreign trade. **Jean Paul Elkmann** will assume direction of the company's new export office.

Olin Industries, Inc. has consolidated all of its brass mill business into an integrated division known as **Western Brass Mills** with headquarters in East Alton, Ill. **Marshall W. Acker,** former general manager of East Alton brass mill operations, has been appointed director of the new division.

Vascaloy-Ramet Corp., North Chicago, Ill., is now installed in new quarters in its Detroit branch office at 512 Book Building. The branch office of the **Fansteel Metallurgical Corp.,** an affilliate company, is maintained at the same address.

Globe Products Manufacturing Co., Los Angeles, Calif. has purchased the Machine Tool Div. of the **Clayton Manufacturing Co.,** Alhambra, Calif.

OBITUARIES

Edward S. Evans

Edward S. Evans, 66, president of the Evans Products Co., Detroit, Mich., died Sept. 6 at his home in Grosse Point Park, Ill., after a brief illness. The Evans Products Co. estimates that $45 million of its total sales were of articles based on Mr. Evans prolific inventions. At one time president of the Lockheed Co., and an organizer of the Stinson Aircraft Corp., Mr. Evans was a director of the National Air Transport Co. and president of the Parks Air College in St. Louis, Mo. In Detroit Mr. Evans was best known for his auto loading devices.

John C. McCullough, general manager of the Erie Bolt & Nut Co., Erie, Pa., until last June, passed away August 29 following a year's illness.

Robert Atkinson, 53, district manager since 1927 of the Steel and Tube Division of The Timken Roller Bearing Co., Detroit, Mich., died in the Alexander-Blaine Hospital, Detroit, after a month's illness.

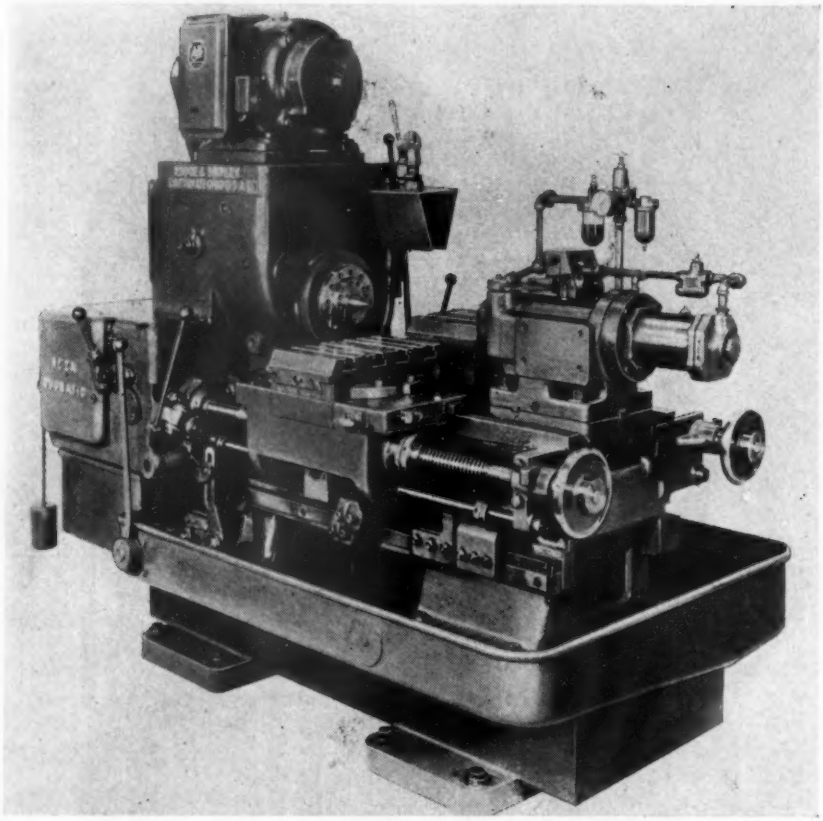
Arthur M. Brewster, 65, New England field engineer for Advance Pressure Castings, Inc., Brooklyn, N. Y., passed away August 30.

Clifford Egan, 61, son of the founder and former president of the J. A. Fay & Egan Co., died September 6 after an illness of six months. Mr. Egan served as president of the Egan company until fiive years ago and since then has been employed by the War Manpower Commission.

Michael E. Dorner, 56, who founded the Cleveland Cutter and Reamer Co. 26 years ago, passed away recently. He developed the company from a small tool shop to its present large plant.

Shop Equipment News

Duomatic Lathe for Low Production Minimizes Set-Up Changeover Time



The 2A Duomatic is arranged to permit high-speed production of short runs of parts with a minimum of changeover time between dissimilar lots. This is accomplished by providing for automatic control changes with adjustment and relocating equipment placed in easily accessible locations

An automatic lathe, the 2A Duomatic, has been developed by The Lodge and Shipley Machine Tool Co., 3081 Colerain Ave., Cincinnati 25, Ohio, for the production of small parts.

The 2A Duomatic is specially designed for quantity production of lathe work arranged between centers, on an arbor, or in suitable chucks or fixtures.

There is a complete front carriage and tool slide, and a complete rear carriage and tool slide, each independently actuated from its own feed screw.

The feed and traverse mechanism provides rapid forward and return traverse, a wide range of mechanical feeds from pickoff gears, pause adjustment, and graduated dial for determining the length of power forward traverse. Provision is made for disengaging the power feed, whenever necessary during the cycle, to return the tools to start of cycle. A separate clutch lever enables the operator to manually set up the required cycles through rotation of a hand wheel at the tailstock end of each feed screw. Control levers enable the operator to start the spindle and the cycles independently from the front or from the rear, or simultaneously from the front. All setups are mechanical, no cams are required to change cycles.

Tool slides can be swiveled to any angle on the graduated tool slide base. Automatic lubrication is provided to headstock, driving pulley, feed and control mechanism. Heavy duty tailstock with built-in revolving center. Graduated dial adjustment for determining amount of power forward traverse. Pause at end of cut. Stopping of spindle during cycle stops both carriage and tool slide travel.

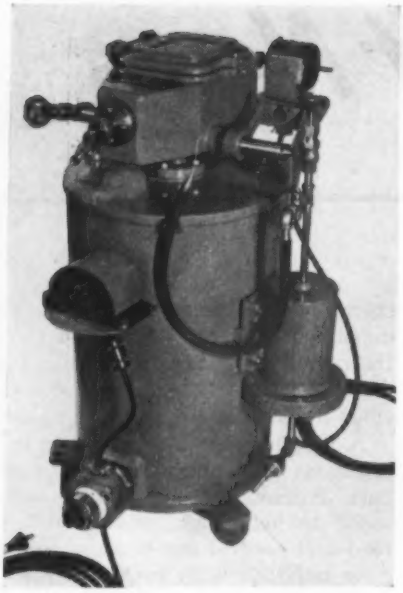
Principal specifications are: Swing over bed 20¾ in. Swing over front or rear cross slide 9-1/2 in. Distance between centers, base length of machine, 15 in. Center distance can be increased in increments of 6 in. up to 27 in. and 12 in. beyond 27 in. Hole through spindle 2⅛ in. Range of feeds 0.003 to 0.050 in. Range of spindle speeds, dependent upon change of gears and driving pulley selected, 50 to 2000 r.p.m. Motors are 5 to 20 hp.

Bennel Ball Bearing Cleaner Cleans by Impinging Oil Smoke

A bearing cleaner, designed to use high temperature oil smoke as a cleaning agent, is manufactured by the Bennel Machine Co., 20 Grand Ave., Brooklyn 5, N. Y. The smoke is forced through the bearings, at high velocities, by an air pressure of 50 to 60 lb. The high temperatures of the smoke prevents chilling and condensation of atmospheric moisture inside the bearing.

Bearings of ⅜ to 4 in. O.D. can be cleaned in the machine. Three interchangeable split cones are used to accommodate all sizes within this range.

The compressed air inlet is connected to a source furnishing compressed air at 50 to 60 lb. pressure. The motor and heater outlets are plugged into a source of a.c. current. The heating unit is switched on "high" and left on for about five



The Bennel bearing cleaner removes lubricant residues and foreign particles by means of high-frequency vibration, automatic rotation of the bearing, and by high-velocity impingement of high temperature oil smoke

minutes to heat the oil, for maximum cleaning efficiency, then switched to "low".

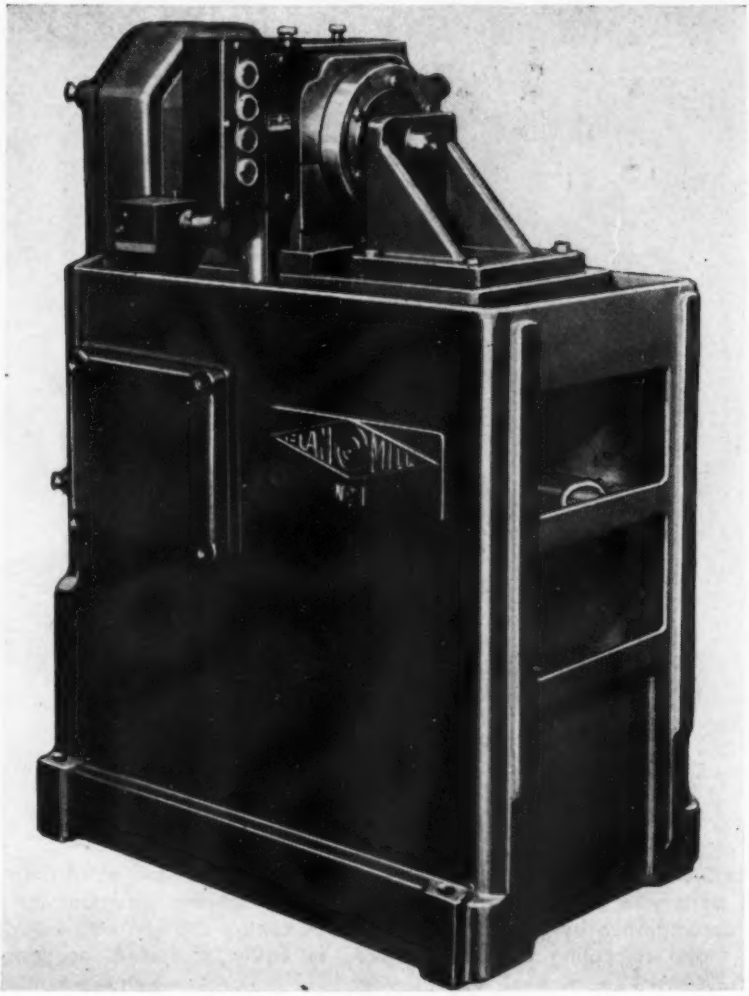
The bearing to be cleaned is first demagnetized by the built-in demagnetizing coil. Then, the bearing is mounted by slipping on a split cone. The vibrator is then connected for approximately 10 seconds, to shake off all surface particles. The compressed air valve is opened and the spray tube is adjusted up or down until the air jet spins the bearing on its inner race at a low speed. The hot oil supply valve is opened until a fine spray is seen through the inspection window. The vibrator vibrates the bearing at 3000 cycles per minute. The hot oil is drawn up and atomized into a fine oil smoke, which is jetted through the revolving bearing at high pressure, cleaning and dissolving dirt and adhering deposits. After about 40 seconds of operation, the oil supply valve is closed allowing the air jet to spin dry the cleaned bearing. This leaves a light film of oil on it to protect against rust.

Up to 100 or more bearings per hour can be cleaned, depending on the condition of the bearings.

The oil filter and storage tank contains a thermostatic heating unit, which is imbedded into the large glass wool filter unit. The oil is thoroughly filtered as it is used, removing all dirt and solid particles. The oil condensing on the inside of the angle head runs down through an outlet pipe to a T shaped tube in the filter, under pressure. There it is forced downward through the glass wool and then rises up through the glass wool again as it is heated and becomes lighter. Thus it passes twice through the filtering material, removing all particles of dirt.

In normal usage, the cleaner consumes approximately a quart of oil a month. The glass wool filter can be removed and renewed through a large plate on the bottom of the tank.

Plan-O-Mill Planetary Thread Miller Has Feeds Electronically Controlled



The Plan-O-Mill is operated by means of an electronic control panel which may be mounted on the floor, wall or ceiling

Tne Plan-O-Mill Corp., Royal Oak, Mich., announces the manufacture of a planetary milling machine designed especially for high-volume thread milling and form milling Called Plan-O-Mill No. 1, it differs from previous planetary milling machines in size and operation. It incorporates features as push-button operation, coordination of feeds and speeds, and Thy-mo-trol electronic feed control for control of feed-in and feed-around.

A complete part can be milled in a single operation requiring as little as 8 seconds. Since the part itself does not move—the revolving cutter being fed around the work—large and cumbersome parts may be handled with ease. The machine has facilities for either external or internal threading, and threads and mills parts up to 2 in. I.D. or O.D., or larger, with offset head.

LODGE & SHIPLEY LATHES AT WORK—

OUTPUT INCREASED 25% TIME SAVED

The advantages of a new, modern machine tool is convincingly demonstrated in the plant of Streeter-Amet Company, Chicago, makers of precision weighing and recording equipment. Here, the new Lodge & Shipley 18" Engine Lathe has effected a 25% increase in production—AND in 25% less time than previously required.

At Streeter-Amet, this new L & S Lathe is used for a wide variety of work—turning, boring, facing and thread chasing parts such as axles, shafts, special gear blanks, aircraft landing struts, hydraulic cylinders, and special lead screws. Metals machined are stainless steel, SAE 2330 steel, and SAE 4140 heat treated steel. Streeter-Amet finds this new L & S Lathe "Very satisfactory for heavy duty and high accurate work . . . holding work to a tolerance of ±.0005". This L & S Lathe is one of a new series of 18, 20 and 22-inch lathes—*completely new* in every detail from pulley to tailstock.

No effort has been spared to make these lathes exceptionally rugged and capable of meeting the finest precision requirements. L & S Engineers will demonstrate how these lathes can do your work better and at lower cost—possibly replace several older, war-weary tools. Write on your company letterhead for detailed Bulletins Nos. 503, 605, 606.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

MACHINE TOOL DIVISION • SPECIAL PRODUCTS DIVISION

3055 COLERAIN AVENUE — 800 EVANS STREET

L & S LATHES

Steel Conveyor Belt Conceals All Moving Parts in Chassis

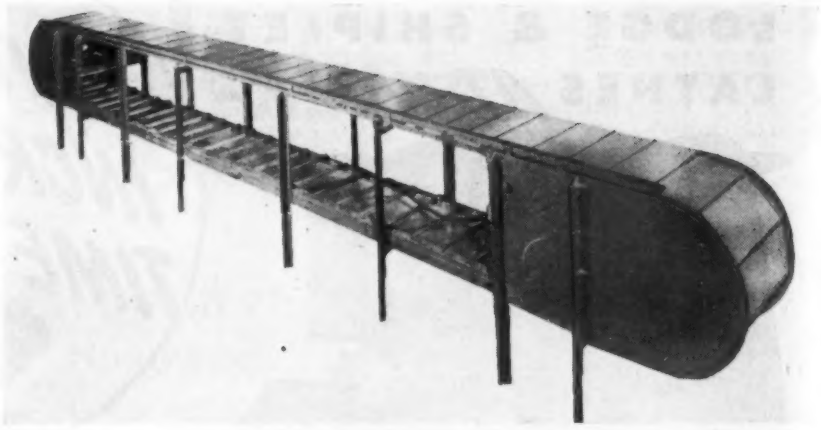
An all-steel conveyor belt has been announced by the Steel Parts Mfg. Corp., Morgan and Quincy St., Chicago, Ill.

The belt is made up of a series of steel plates linked together at the ends. This makes for ease of maintenance, because, should a belt plate become damaged, the damaged plate may be slipped out and a new one inserted. The belt is driven by a drive-sprocket that meshes with the hinges of the belt, providing a positive non-slip movement.

There is no sag at any point along the belt length, and no open spaces between links, so that a flat working surface is presented at every point. The belt is held taut throughout its length.

The conveyor is not a heavy unit, but it is capable of handling extremely heavy loads.

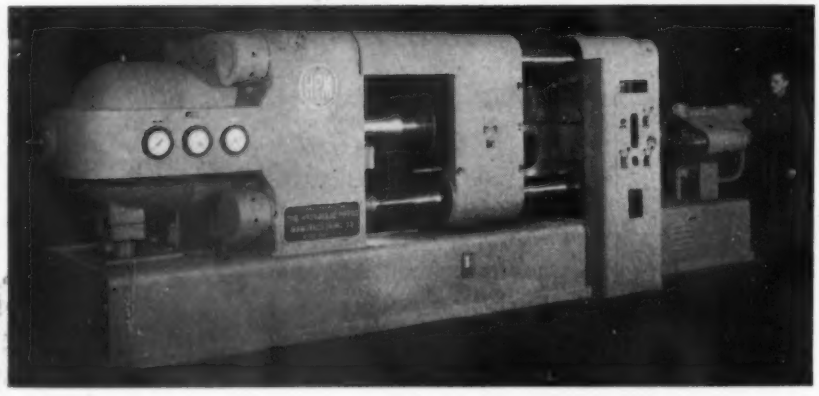
The only exposed moving part is the belt itself. The drive sprocket and motor are enclosed, and the edges of the belt are provided with a guard rail.



The all-steel conveyor belt is direct-driven by sprockets which engage the link joint beneath the conveying surface

Each of the conveyors is engineered to the specific job it is to do. Belts are available in varying widths and lengths to suit every requirement. The factors taken into consideration in the individual design of the belt are: weight and size of the object to be carried; distance to be travelled; and speed of operation.

Hydraulic High-Pressure Casting Machine Casts 154 Cubic Inches



H-P-M die casting machine is equipped with automatic controls and an hydraulic ejector and core pull system for production of high pressure castings of large volume in aluminum alloy products

The Hydraulic Press Manufacturing Co., Mount Gilead, Ohio, announces a high pressure die casting machine designed to cast 14.88 lb. of aluminum alloy per "shot" at an injection pressure of 25,000 lb. per sq. in. This weight represents a casting volume of 154½ cubic inches.

Both mold clamp and injection plunger are actuated by direct hydraulic means. The machine is powered by two H-P-M Hydro-Power radial pumps, directly connected through flexible couplings to a 100 hp. double-end-shaft motor. The movable mold clamp platen is equipped with a hydraulic ejector. The operating system is designed for installation of hydraulic core pulls and automatic hydraulic ejector systems by ample provision for operating mechanisms.

Ajax Stock Heaters Increase Speed of Forging Operations

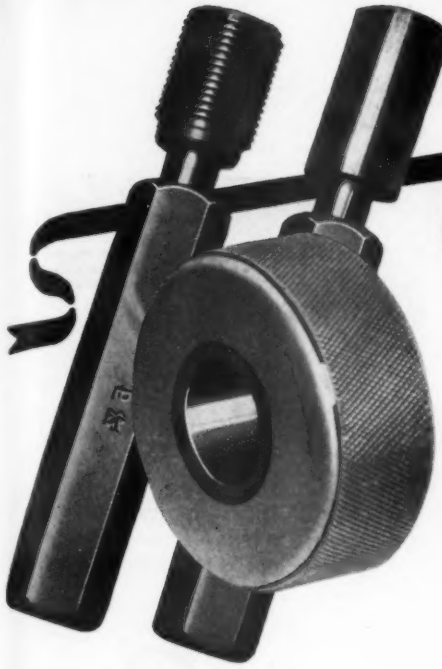
The Ajax-Electrothermic Corp., Ajax Park, Trenton 5, N. J., are the manufacturers of the vertically mounted Ajax-Northrop high-frequency induction heaters. The part to be heated, held in a holding cup, is thrust up into the heating coil by a pneumatic ram. Power is applied, and is automatically cut off when the exact temperature is reached. The pneumatic ram then lowers the heated piece to a conveyor for subsequent operations. When used for heating bars or tubes for forging, upsetting or spinning operations, the speed is one piece per minute with a 250 kw source.

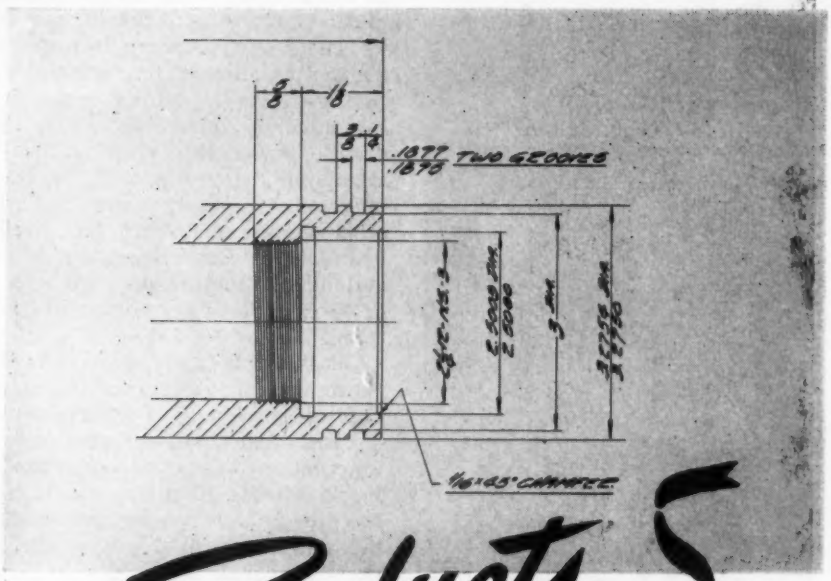
Controls are easy to operate and

Specifications for H-P-M Die Casting Machine

Mold clamp pressure (ton)	1000
Maximum mold/mounting/space	31 × 56 in.
Maximum daylight opening between mold mounting surfaces	48 in.
Maximum mold clamp travel	24 in.
Injection stroke (maximum)	18 in.
Electric motor (hp.)	100 in.
Shipping weight	103, 400 lb.

Better Gages





MAKE POSSIBLE

Better Products

EVERY advancement made in precision manufacturing has followed or coincided with an improvement in gaging methods. Extremely close tolerances have been made possible in production only because gages were produced to provide the required inspection accuracy.

Lincoln Park's development and use of Carboloy for gages has made it possible for hundreds of concerns to produce parts to much closer limits than would ever have been considered practical a few years ago. In Lincoln Park Carboloy gages, wear allowance is not necessary. At no time are they "over-size" but are accurate to required limits from the first inspection. They provide the precision which is so essential when a slight variance from accurate gage limits could mean the rejection of many parts that actually should be accepted.

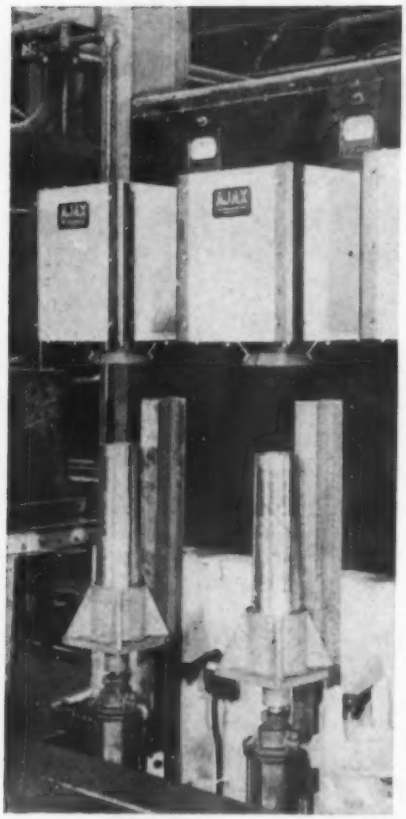
The trend toward even greater precision in manufacturing operations will definitely continue into the post-war years. If you are to remain competitive in your markets, you too, will be producing better products to new standards of accuracy. And, as always, better products will call for better gages such as are now being made—and will continue to be made—at Lincoln Park.

ARMY E NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1721 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN



Ajax-Northrop high-frequency induction heaters provide high thermal capacities in limited space and reduce scale formation on surfaces

are automatically timed for the full heating cycle. Each piece gets the same treatment—top heat at the end—tapering off toward the unworked portion. Any heating pattern can be achieved by proper coil design. Scale is negligible, resulting in long die life and less die cleaning. By changing heater taps and time cycles, the same equipment can be used for many heating operations.

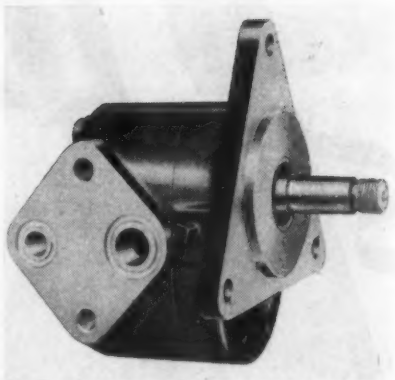
R-M Inserted Brake Blocks Permit Quick Replacements

Raybestos-Manhattan Inc., Passaic, N. J., are the manufacturers of a brake block material, for power presses and other industrial uses, that can be removed for replacement without the necessity for disassembly of shoes or brake bands. The Key-Lok construction consists of lateral fishtail metal strips, or keepers, in which retaining bolts are inserted; spaced to fit the brake blocks. The keepers slide into matching slots cut in the brake block. By this means, the bolts, bands and shoes need never be removed for relining; loosening the keeper nuts permits removal.

Pesco Hydraulic Pump Gains High Volumetric Efficiency

High volumetric efficiency is a feature of the general-purpose hydraulic pump announced by Pesco Products Co., Cleveland, Ohio. Calibrations show volumetric efficiencies of 95 percent and better at 3000 r.p.m., under pressure of 1,500 lb. per sq. in. The gear-type pump, incorporating the pressure-loading principle of the Pesco aircraft pumps, is suitable for universal application where hydraulic power is utilized. It has a triangular mounting pad, or SAE magneto flange, or is adaptable to other design mountings for special installations. Capacity rating is 3.5 gallons per minute at 1,500 r.p.m., or seven gallons per minute at 3,000 r.p.m. Weight is 4.4 lb.

Gears, case and shafts of the Pesco hydraulic pump for industrial uses are designed to withstand the stresses of constant load applications inherent in production operation of machine tools. Heat rise is held to a low level and dissipation through the case maintains this level. Precision-faced seals are used at pressure joints to eliminate leakage.



The Pesco gear-type hydraulic pump is designed to permit compact assembly of drive-motor, pump and actuated mechanism

The Barret portable lathe can be wheeled to any job and set up to operate as an internal grinder or boring machine

Barret Portable Lathe Grinds Or Bores at Field Locations

Barret Equipment Co., St. Louis, Mo., announce a portable lathe which can be used for field service work, or in locations where time and labor can be saved by bringing the lathe directly to the job. The equipment is especially useful where fixed base, or machine shop service facilities are not available.

The outer end of the shaft rests on a steadyrest, or outboard support, to prevent off center deflection of the shaft due to the weight of the object being machined. Built on the principle of the internal boring bar, the lathe has a swing range of from 7 to 24 in., is built to operate on any 110 volt a.c. or d.c. line and is equipped with a rheostat speed control. The equipment is moved on two rubber-tired wheels.

STRAIGHTENING

Jobs for the Colonial "Junior"

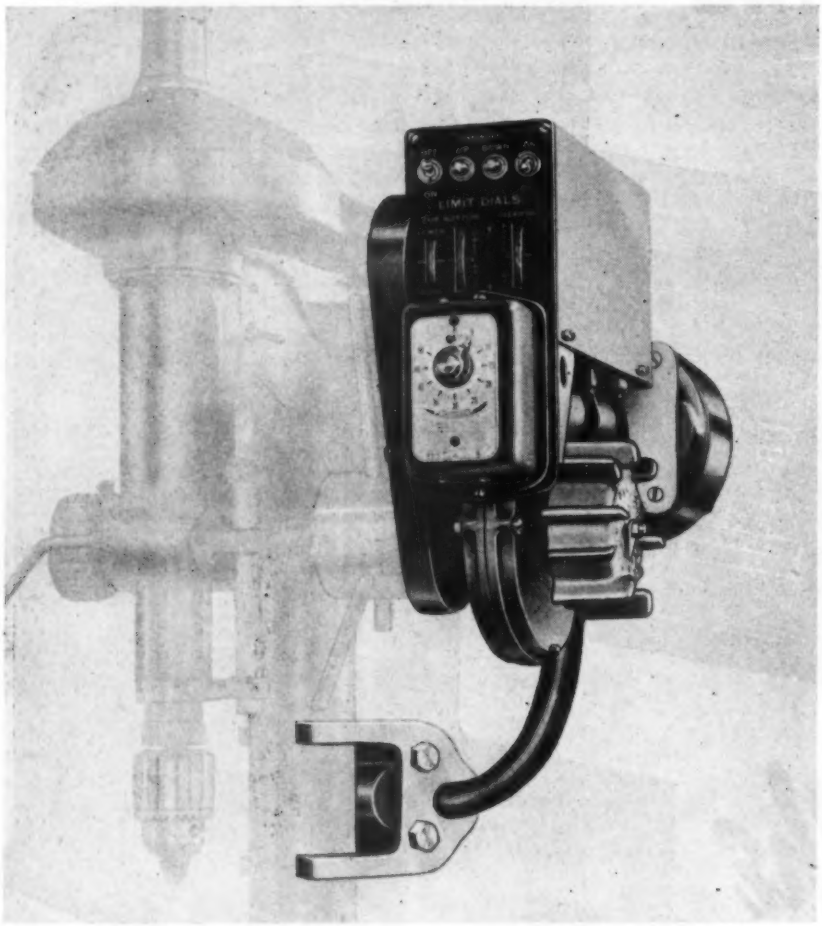
In addition to broaching and assembly work, Colonial Junior Hydraulic presses (1 to 4 tons) are ideally suited to straightening operations on smaller diameter work. No changes are required in the machine. Merely place the straightening fixture (available from Colonial) on the machine platen and you are ready to go to work.

Ask for Bulletin #VJ1-44S

colonial BROACH COMPANY
DETROIT 13, U.S.A.

Broaches — Broaching Machines - Broaching Equipment

Knapp Pre-Selectric Power Feeder Mechanizes Drilling Operations



The unit permits hopper feed of work to the drilling fixture, with the operating cycle controlled by energizing a circuit through the Knapp Pre-Selectric power feeder, and an electrical interlock to assure proper work positioning

The Pre-Selectric power feeder, manufactured by the James H. Knapp Co., 4920 Loma Vista Ave., Los Angeles 11, Calif., automatically duplicates the operations of a skilled mechanic when deep drilling or tapping small holes, providing automatic chip clearance at pre-selected depths during the drilling or tapping operation.

The machine mounts by a bracket on the drill press column and by attaching a collet to the drill press spindle feed shaft. Positioning of the power feeder is not critical, it the collet with the spindle feed being governed by the alignment of shaft. The weight of the unit is balanced on its support arm, no weight being added to the drill press spindle feed shaft bearings.

The feeder will consistently drill No. 50 holes, through alloy steel plate, to the full length of the drill without drill breakage and with less dulling of the drill than when controlled by hand.

All controls on the Pre-Selectric power feeder are available to the operator from the normal position of the operator in front of the drill press. The three switches at the top of the panel are: (1) on-and-off switch for automatic operation; (2) up and down control switches, the down switch starting the cycle and the up switch reversing the spindle, returning it to the up position at any desired point in the operating cycle. The third switch in the upper panel is the main power switch. The lower row of edgewise control dials are the limit dials controlling the depth of the drill as to top and bottom limits and the extent to which the drill is raised for chip clearing. The drill may be partially or fully raised from the hole to clear chips. A timer is provided to control the length of drilling time between chip clearance, exactly duplicating a hand drilling operation. To the right of the timer is a pressure adjusting knob which sets the amount of pressure on the drill, thus controlling the rate at which the drill is fed into the work. The unit operates on 110 volt single phase or 220/440 volt three phase current.

In operation, the feed provides timed, reversible, adjustable torque with automatic start of the cycle and automatic stop. It retracts the drill for full chip clearance at a preselected point. When used with any standard tapping head, the unit becomes a precision automatic tapper. The tap is lifted high enough for chip clearance, but not completely removed, which is of advantage in blind tapping when a chip driver ahead of the tap is a disadvantage.

Metro Work-Holding Positioner Holds Work at All Angles

Metro-Vise Co., 234 Stephenson Bldg., Detroit 2, Mich., are the manufacturers of the Metro positioner to simplify assembly operations by permitting the angle of tilt to be adjusted. In use, the vise or fixture is bolted to the faceplate of the positioner. This plate is integral with a ball in the socket formed by two clamping jaws, so shaped and pivoted as to maintain a firm grip of the ball, yet so tensioned as to let the ball roll in the socket when a change in the angle of tilt is desired. Holding pressure exerted on the ball is supplied by a heavy tension spring which actuates the two clamping jaw members.

Holding tension of the Metro positioner is adjusted by the tension screw which preloads the spring

Pressure by the babbitt jaws is

Now you can find it all UNDER ONE COVER . . . .

232 pages

- Hobbing and Hobs
- Shaping and Shaper Cutters
- Gear Cutters
- SHEAR-SPEED Gear Cutting
- Gear Finishing and Gear Finishing Machines
- Gear Lapping and Gear Lapping Equipment
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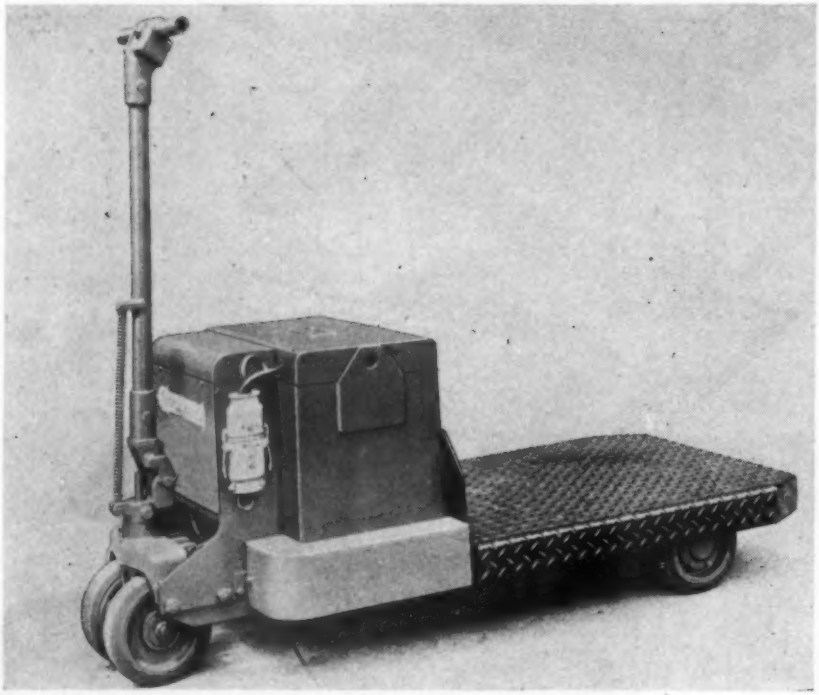
MICHIGAN TOOL COMPANY 7171 E. McNICHOLS RD. Detroit 12, Mich., U.S.A.

sufficient to hold the ball in position during normal assembly operations. However, when the vise or fixture requires a different angle, the ball is responsible to hand pressure. There are no fixed graduations, therefore there is unlimited freedom of movement. When proper adjustment is made there is no time lost in making tilting adjustments, and both hands are left free for other work. The tension of the spring can be adjusted to the pressure of the work being performed.

Fingertip Control Handle Operates Two-Ton Motorized Platform Truck



The motorized platform truck can be operated forward or backward by means of the control unit placed on the steering handle

A motorized truck with fingertip control is manufactured by Lift Trucks, Inc., 2425 Spring Grove Ave., Cincinnati 14, Ohio. This truck is not a lift truck—the bed is stationary. Heavy loads are placed on the truck by hand, crane, or otherwise. Safety rated capacity is 4000 lb. Finger tip control permits easy maneuvering of the load forward or backward to destination. Finger tip control consists of two buttons on the handle, one for forward motion and one for reverse, operating in conjunction with an Allen-Bradley controller unit. Also has dynamic brake control, forward or reverse speed of 312 feet per min., when empty, and 220 feet per minute loaded. Power is generated by heavy duty batteries which operate 10 to 20 hours, under maximum load, without recharging.

The drive motor is a 12 volt inclosed, continuous-rating, series motor with 14.5 to 1 reduction, giving high starting torque without excessive heating. Rear drive transmission is through sets of spiral bevel and spur gears. All gears are alloy steel, heat treated, with ball bearings, and are operated in an oil bath. The batteries can be charged on regular equipment, already available in plants using batteries, or a rectifier can be furnished for overnight charging.

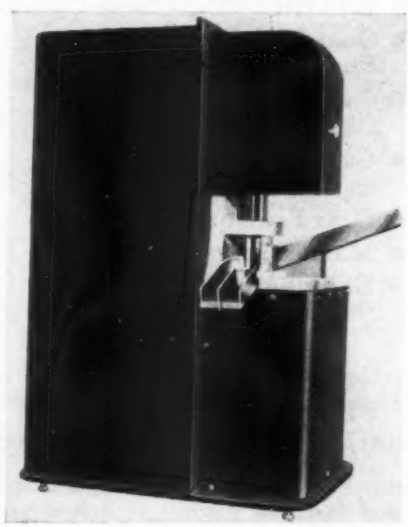
All-steel construction is used in the frame, with parts standardized, interchangeable and heavily reinforced with ample factor of safety at maximum load. Welding is limited to low stressed parts and where accessibility does not increase maintenance costs. Important wearing points are hardened.

Wheels are of alloy steel castings with sealed ball bearings on alloy steel axles and are provided with rubber tires. Front wheel load is taken on a Timken thrust bearing in the steering column.

Autotron Electronic Gages Facilitate High Gaging Rates

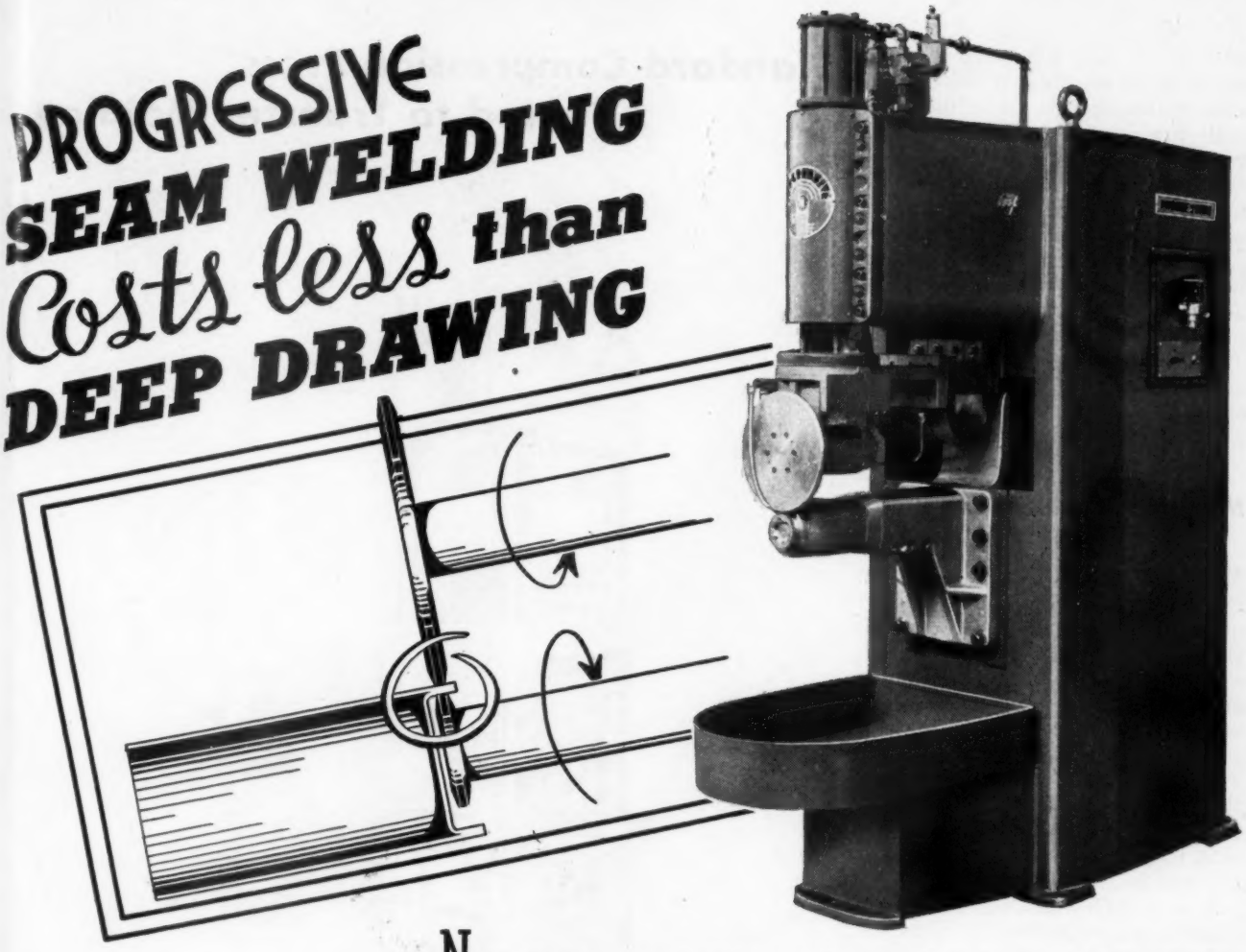
An electronic gaging instrument has been developed by The Autotron Co., Danville, Ill. Entirely automatic, the machine can gage the depth of holes, external lengths and outside diameters to very close tolerances. It operates at speeds up to 3300 pieces per hour. Speed of the machine depends upon the size, shape and manner in which the part to be gaged may be handled. When possible, the machine can be hopper fed into a loading chute from which point the machine automatically feeds the pieces into inspection position.

Mechanical contact is made at a desired point in the work by a stylus rod to which is attached a razor-like flag. Image of this flag is projected into an optical system by light. A high magnification is produced, causing a shadow of this flag to be projected and reflected onto a panel of two photo-electric tubes. Distance between these two tubes represents the tolerance of the dimension being gaged. This distance can be widened or narrowed by micrometer adjustment according to the tolerance desired. The shadow of the flag must lie between the two photo tubes for the part to be automatically accepted. Acting as switches, one tube must be covered by shadow and the other must be in the light to activate the acceptance mechanism. If the dimension being gaged is below the limit both tubes



Electronically actuated mechanisms of the Autotron gaging machine provide instant response to impulses induced by insertion of parts and permits inspection speed of 3,300 pieces per hour

PROGRESSIVE SEAM WELDING Costs less than DEEP DRAWING



PROGRESSIVE field engineers, backed by a greatly expanded staff of design and application engineers selected from the resistance welding industry for their breadth of experience and "results", will be glad to help you simplify and speed up your assembly and welding operations.

Have you seen "Resistance Welding at Work"? Ask for this 60 page Booklet No. WP-44

NOT in every instance, perhaps—but in enough to make it very well worth while looking over YOUR new designs of stamped and drawn parts to see how much can be saved by using simpler stampings, etc., and seam-welding them together.

PROGRESSIVE seam welding is fast—frequently only seconds are needed for seams several feet long.

PROGRESSIVE seam welding is stronger—it eliminates deep-drawing strains and thinning out of stock where strength is needed.

PROGRESSIVE seam welding is easier to tool—no time-consuming delays waiting for large and costly dies. Permits quick, inexpensive changes in design whenever desired.

PROGRESSIVE seam welding gives greater design flexibility—it eliminates restrictions on drawable shapes, permits the combination of light and heavy gages to form a single part. Equipment can be either stationary or portable.

IT PAYS TO WELD

PROGRESSIVE Welder Co. 3050 E. OUTER DRIVE • DETROIT 12

RESISTANCE WELDING EQUIPMENT

will be in the light causing the pieces to be rejected. If the dimension of the piece is above the limit both tubes will be shadowed also causing the piece to be rejected. According to the makers, it is possible to gage dimensions with tolerances as small as 0.001 in. with accuracy.

It is possible to gage the depths of holes using either end of the pieces as a reference point; shoulders within holes; projections from the bottom of holes; outside length of pieces or outside diameters. These may be single operations or with special fixtures, multiple operations.

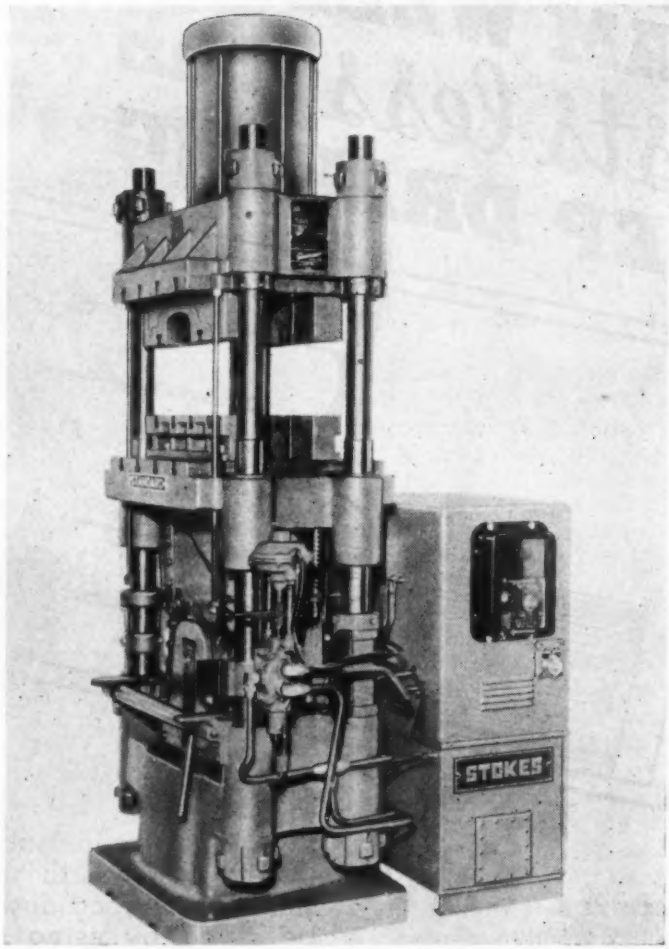
Moore Air Gage Inspect Bore And Periphery Simultaneously

Moore Products Co., Lycoming St., Philadelphia 24, Pa., announces an addition to their line of pneumatic comparator gages. This air gage, for simultaneous inspection of I.D. and O.D., has an adjustable feature which permits its use on a wide range of sizes in both dimensions. The adjustable jaws which measure the O.D. and the interchangeable plugs which measure the I.D. are both equipped with pneumatic gaging nozzles.

A cam lock fixes the pneumatic plug in correct position and provides a leak-proof air connection. Reference surfaces, for use in setting the gage, are provided on the jaws, behind the gaging position. In order to locate these adjustable members, an acceptable work piece is placed at the bottom of the plug, and the refence surfaces are brought in contact with the work. The need for micrometer adjusting screws is eliminated. The jaws are locked with set screws, and the acceptable work piece is allowed to remain in the setting position while the gage is in operation.

Moore air gage, for simultaneous inspection of bore and periphery, can be used to indicate conditions of concentricity

Standard Compression Press Adapted to Transfer Molding



Stokes compression press requires low hydraulic pressure and is readily adaptable to transfer molding

A combination press, for either compression or transfer molding, is announced by F. J. Stokes Machine Company, Philadelphia 20, Pa. By using a single pumping unit to apply pressure in compression molding and to lock the mold and supply hydraulic pressure to the transfer ram the dual-purpose operation is achieved.

The transfer cylinder is mounted on the head of the press and operation of the ram is controlled by a sequence valve. The power unit has greater capacity than in the usual compression press to provide the high mold closing speed and ram speed necessary with induction or electronically heated preforms in transfer molding. Conventional semi-automatic compression molding press is achieved by closing a valve and cutting out the transfer cylinder.

In one method of loading a space is provided in the upper bolster and, after the mold is closed, either the preform or powder is loaded into the space and pressure automatically applied through the transfer plunger when the operator trips a safety control lever. The plunger then moves rapidly in the clear and builds up pressure at a lower speed as resistance develops. In the second method loading is on the lower die plate, with the press open. The preform is spotted in the center of the die and a push of the start button completes the cycle except for removing the finished molding. This feature permits the operation to be changed from compression to transfer molding in a short time.

The press has a capacity of 150 tons; transfer cylinder pressure, 30 tons; maximum opening between platens (lower platen up), 26 in.; platen area, 26 in. x 23 in., and requires a 5 hp. drive-motor.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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Climax Molybdenum Company

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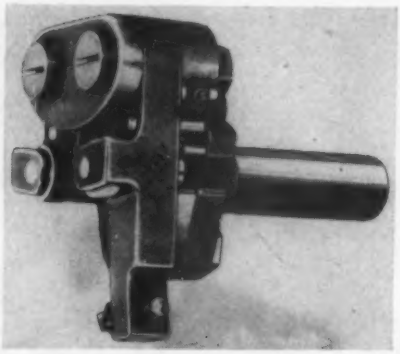
MOLY

Parts and Materials



The Boyar-Schultz knurling tool operates from the centerline of the material and eliminates knurl climb

Boyar-Schultz Knurling Tool Knurls Long Stocks Evenly

The Boyar-Schultz Corp., 2124 Walnut St., Chicago, Ill., are the manufacturers of a knurling tool, for operation in screw machine turrets, that facilitates knurling operations on long parts and those requiring knurls between or behind shoulders. Feed and pressure are simultaneously applied to both sides of the work by cantilever action; this action avoids transverse strains and springing on the spindle.

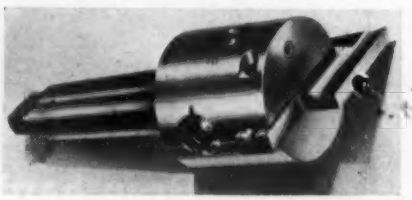
It is made in 3 sizes; OOK-00 to 3/8 in., OK-3/16 to 5/8 in., and 2K-1/4 to 7/8 in.

TCT Carbide-Tipped Core Drill Increases Time Between Grinds

Carbide-tipped core drills, specifically intended for use in drilling hard, scaly cast irons, such as rough-cast engine exhaust manifolds, are manufactured by Tungsten Carbide Tool Co., 2661 Joy Road, Detroit 6, Mich. The core drills are not carried as stock items since dimensional requirements of different applications limit standardization to general design.

When core drilling hard, scaly cast irons with standard types of carbide-tipped core drills, the drills have a tendency to chip and break down fairly rapidly. The TCT core drills are the result of a study of the effect of various carbide grades, tool shapes, shank materials, tool angles and number of flutes on the life expectancy of tools under such conditions. The body form, cutting angles and carbide mass are designed to meet the conditions encountered in the study.

It is reported that the drills are capable of a life of 10,000 holes 1 5/8 in. dia., 5/8 in. deep, between grinds. In breakdown tests, as high as 50,000 pieces per grind were obtained with the TCT core drills, although this practice is not recommended.



Heavy construction and locking devices of the Behr boring bar assure accuracy under heavy cutting loads

Behr Boring Tool Eliminates Chatter and Blade Slippage

Behr Products Co., Warren, Mich., have developed a boring bar in two standard head diameters, 2 in and 3 1/2 in., for use on vertical or horizontal lathes, screw machines and precision boring machines. Due to its heavy construction, the bar is claimed to eliminate chatter, takes a faster feed and up to four times wider cut than average.

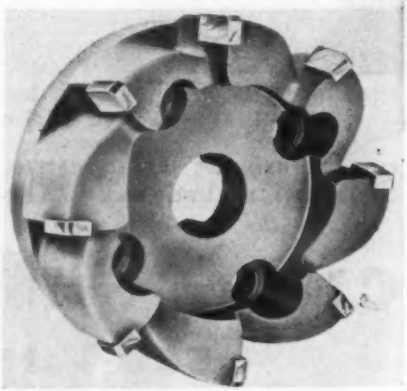
The bar has an accurate micrometric blade adjustment. Blades are available in a full range of sizes either tungsten carbide tipped or faced, or in high speed steel. Blades are interchanged by a half turn of the blade release mechanism. Regular blades bore or face from 1 3/4 to 12 1/2 in. dia. with accuracy. A small tool adapter permits boring holes down to 1/4 in. or less. Micrometer feed-screw is locked in position by setscrews.

Nelco Cutters Adapt Light Machines to Hyper Milling

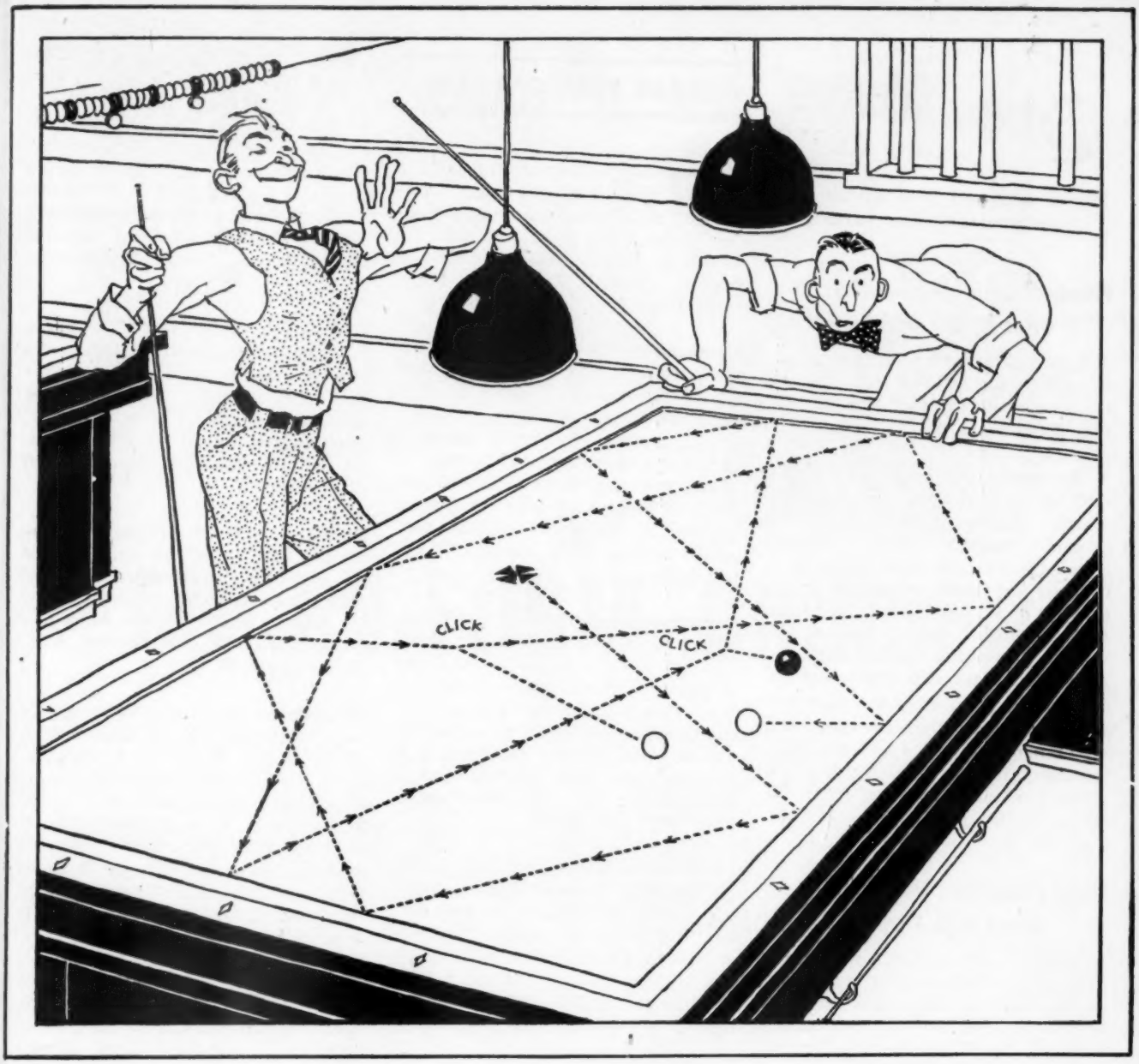
Carbide tipped milling cutters and mills, designed for machining all metals and plastics, are manufactured by the Nelco Tool Co., Inc., 370 Hamilton Ave., Brooklyn 31, N. Y.

The line includes two and four flute carbide end mills from 1/4 in. up to 2 in. dia., large end mills up to 5 in. dia. with No. 50 NMTB shanks, shell end mills, face mills, slotting cutters and half side mills up to 8 in. dia.

The cutters are a heavy, brazed-in type embracing several features. The bodies are a special alloy casting having extremely high strength. Designs are purposely heavy to create a flywheel action. An 8-in. Nelco face mill weighs 25 lb. Heavy carbide tips are employed to withstand shock, improve tool life, and permit many regrinds before new tips must be brazed in. A special brazing method is used which increases the number of pieces machined per grind at least 70 percent besides greatly decreasing the possibility of breaking the tips. The cutters are manufactured for mounting on standard No. 50 NMTB spindles or standard milling cutter arbors.



Nelco carbide-tipped cutters are signed to provide a flywheel action and eliminate vibration and chatter when used on equipment with light shafts and operating mechanism



Nothing Rolls Like a Ball . . .

. . . and this triumphant gentleman profits by his skilled application of that fundamental fact.

That same fact, applied in New Departure *Ball* Bearings, brings new efficiency—and profit—to industry. Industry which *must* "keep 'em rolling"—(and nothing rolls like a ball).

Today, Industry is faced with new and mounting problems of higher speeds, heavier loads and greater and greater precision. *Ball* bearings carry the loads on free-rolling steel balls—*making possible* higher speeds, heavier loads and greater precision.

Yes, in millions of applications, New Departure Ball Bearings are proving their *unique* fitness for the new scheme of things mechanical.

There is more for you in New Departure Ball Bearings than steel and precision. Advanced engineering and a desire to serve are tangible plus values.

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BALL BEARINGS

3380

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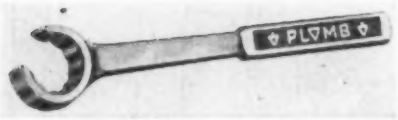


Plomb open-end flare nut wrench is designed to fit close quarters

Plomb Wrench for Flare Nuts Grips Plastic and Soft Metal

A flare nut wrench for use on plastic pipe tubing and soft metal fittings is announced by the Plomb Tool Co., 2209 Santa Fe Ave., Los Angeles 54, Calif.

The head is flat based on a modified 12-point design, with opening which allows access to fittings around tubing. These features, coupled with deep, thin walls, permit use in close places and small turning arcs. Possibility of damage to the fitting is remote because the wrench has better contact with the nut and cannot slip and chew it.

The primary uses of the flare nut wrench are in the assembly and maintenance of all types of lines, including fluid, air, and gas. The wrench is made in sizes from 1/2 in. to 1⅛ in.

Lincoln Improved Electrode Gives High Tensile Strength

A shielded arc electrode for groove butt joints and welding horizontal or flat fillets in high tensile steels, such as A.S.T.M. A-212, has been announced by The Lincoln Electric Co., Cleveland, Ohio. Designated as Fleetweld 11-HT, the electrode has a low spatter loss and welds are produced with a steady arc and are free from undercut.

Speeds are good, and low alloy, high tensile steels can be welded as easily and as fast, with Fleetweld 11-HT, as mild steels can be welded with the E-6020 type of electrode. Weld metal specimens of Fleetweld 11-HT are characterized by tensile strengths of 75,000 to 80,000 lb. per sq. in., as welded, and 72,000 to 76,000 lb. per sq. in., when stress relieved.

The electrode can be used with either alternating current or direct current, and, if direct current is used, the electrode should be negative. The electrode conforms to American Welding Society specifica- E-7020 and/or E-7030, and is available in 3/16 and ¼ in. dia. 18 in. long.

TRADE PUBLICATIONS

Abrasive — Bulletin 628 of eight pages about "Factors in Belt Grinding and Finishing with Idler Backstands" describes converting polishing lathes into belt grinders by using an idler backstand and an endless abrasive belt. Behr-Manning, Troy, N. Y.

Combustion—Bulletin 1145 describes the operation and characteristics of type SO regulator for the control of suction, pressure or flow in any gas or air system. A colored drawing shows the operation and there is a drawing giving outline dimensions. Used to control pressure in a wide variety of industrial heating furnaces. Hagan Corp., Hagan Bldg., Pittsburgh, Pa.

Compressors—Bulletins C-1100-B21, B22 and B23 describes, illustrate and list dimensions of many types of gas and steam engine driven refrigeration compressors and booster compressors equipped with feather valves. Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., 426 Worthington Ave., Harrison, N. J.

Connectors—Leaflet No. 424-43 lists a variety of types of cable connectors with and without insulation to hook-up, lengthen, replace or shorten cables which will handle 1, 1/0, 2/0, 3/0 and 4/0 cables. Chicago Tool & Engineering Co., 8383 South Chicago Ave., Chicago, Ill.

Coolers—Bulletin C-1100-B27 describes, illustrates and lists dimensions of evaporative coolers which provide a closed circuit for the jacket water for engines and reduces scale formation on the engine jacket, replaces existing cooling towers. Made in 14 sizes to take care of heat transfers of from 6,000 to 56,250 B.t.u. per minute for cooling oil or water in quantities ranging from 36 to 337 GPM. Worthington Pump & Machinery Corp., 426 Worthington Ave., Harrison, N. J.

Diamond Wheels—Catalog 44 describes, illustrates and gives dimensions of diamond mounted points and wheels of many shapes; it includes single and multiple point radius, contour and wheel dressing tools. There is also included a table of recommended sizes of diamonds for various diameters and widths of abrasive wheels. Precision Diamond Tool Co., 30 W. Washington St., Chicago 2, Ill.

Dies—Catalog S. 2nd Edition, illustrates and describes "strippits" which can be used wherever spring pressures are required to strip work or scrap from blanking or forming dies. Wales-Strippit Corp., 345-349 Payne Ave., North Tonawanda, N. Y.

Drills—Catalog No. 4-D of 150 pages describes and illustrates taper and straight shank twist drills, shankless roll-forged drills, sleeves, sockets, and special types of drills; there is a technical section. Republic Drills & Tool Co., 322 S. Green St., Chicago 7, Ill.

Drives—Four-page catalog has condensed and simplified drive tables for fractional horsepower wedge-belt drives. It includes specifications for sheaves and belts. The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.

Electronics—Booklet E6358, a 20-page "Introduction to Electronics," by Dr. Walter Richter, is a brief discussion of the fundamentals of conversion and control of electric power and the subject of electron tubes; it explains that the electron tube is nothing but a special type of rheostat or switch. Allis-Chalmers Mfg. Co., 1941 Ristow St., Milwaukee 1, Wis.

Engines—Bulletin "Diesel Facts" of 12 pages describes municipal power plant installations and lists their economical operating costs. Diesel Engine Manufacturers Association, 1 La Salle St., Chicago 2, Ill.

Equipment—Folder describes and illustrates steel work benches, shelving, bins, and other shop facilities. Equipto, Aurora, Ill.

Files—8 page catalog describes and illustrates milled curved-tooth files of many lengths and types, rotary files, flexible blades, half circles and others. American Swiss File & Tool Co., 410 Trumbull St., Elizabeth 1, N. J.

Forgings—Bulletin 145 about "Brass and Bronze Forgings" illustrates and gives some information about the variety of output. Titan Metal Manufacturing Co., Sieg and Craig Sts., Bellefonte, Pa.

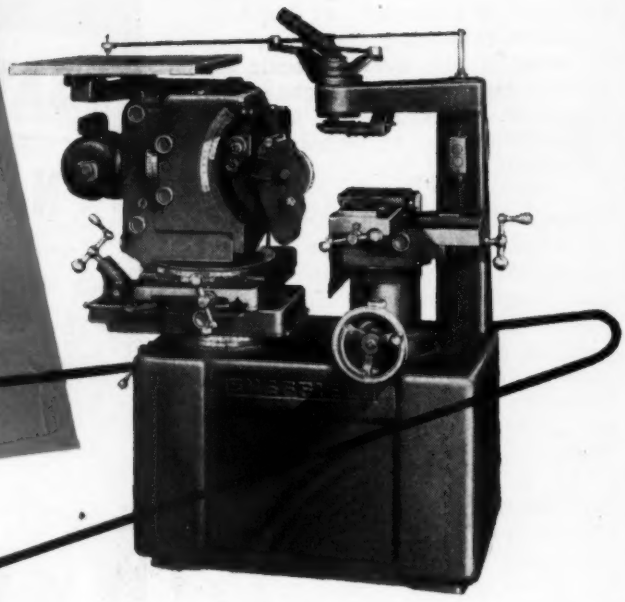
Furnaces — Bulletin 113 of eight pages about "Isothermal Quench

MAKE PUNCHES AND DIES

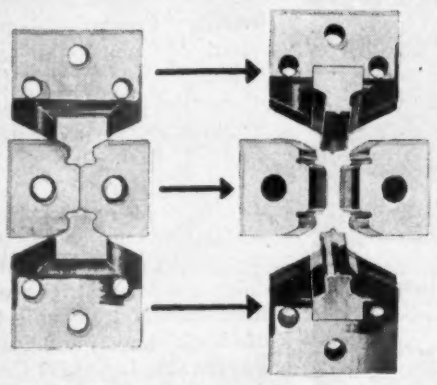
In Half the Time

TO PRECISE LIMITS

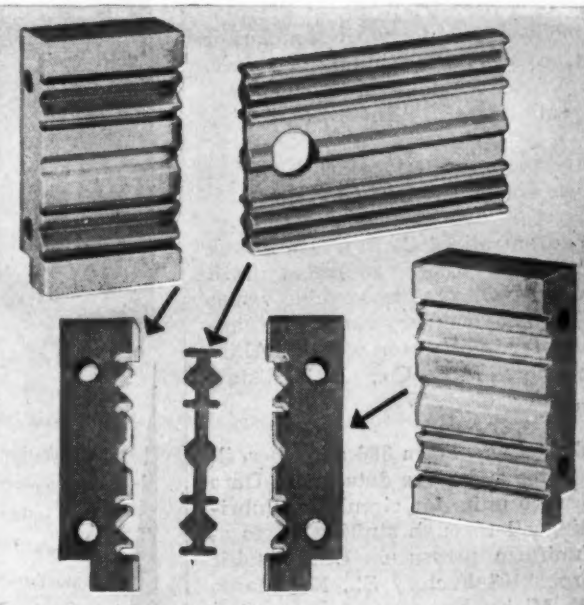
with the



MICRO-FORM GRINDER



If you are grinding punches and dies to close tolerances, you will be interested in the following performance figures. Herewith is illustrated two punches and a pair of matching die halves for producing the notched forms at the ends of a standard razor blade blank. Each punch is ground in 6 hours and the die halves, with closely specified clearance angles, are ground in 6 hours apiece.



Shown here are a die set—a punch and two die halves for slotting razor blade blanks—a difficult, precise grinding job. The punch, about 2 inches long, is ground from a roughed-out heat treated blank in just 16 hours including all alignment and checking. The two matching die halves are ground in 8 hours each (floor-to-floor).

write for booklet M-120-144 telling how to grind profiles direct from the drawing faster and at lower cost.

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U. S. A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

Furnaces" for heat-treating steels to increase their physical properties without producing distortion, preventing cracks, avoiding scale and decarb but increasing toughness and ductility. Ajax Electric Co., Inc., Frankford Ave., at Delaware Ave., Philadelphia 23, Pa.

Gages—Bulletin 500-45 illustrates and describes many types of visual gages for precision measuring; there are diagrams of scales and illustrations of many types of anvils, V-blocks, gaging tips and extensions, thread checking attachments and sine bar for checking tapers. Sheffield Corporation, Box 893, Dayton 1, Ohio.

Grinder—Folder of four pages illustrates and describes a precision attachment for doing round work on a surface grinder; capable of grinding plain cylindrical or tapered work; has an indexing head, tailstock, live center and collets. Strong Manufacturing Co., 5312 Westminster Ave., Philadelphia 13, Pa.

Grinding—Segment folder S-1 describes Por-Os-Way segmental grinding blocks for various makes of surface and force grinding machines. A. P. de Sanno & Son, Inc., 946 Wheatland St., Phoenixville, Pa.

Governors—Bulletin B6356 of 24 pages about "Modern Governors for Large Hydro-Electric Units Provide Centralized Control" shows the application of speed controls to fixed propeller with movable guide vanes, adjustable runner vanes, or impulse types of water wheels. Allis-Chalmers Mfg. Co., 1941 Ristow St., Milwaukee, Wis.

Lubrication—Form 386 describes, illustrates and gives data about Dura pressure units for circulating lubricating oil through stuffing boxes at a uniform pressure. Durametallic Corp., 2104 Factory St., Kalamazoo 24F, Mich.

Marking—Steel stamps, dies, molds and other tools for identifying various manufactured articles made in many types and sizes. Illustrations show the many kinds and types of product they are used on. Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.

Milling—Leaflet No. 600 describes a vise which can be attached to the cross-slide of a lathe and used for a milling attachment. It can be adjusted vertically and swung through vertical angles. Can be applied to lathes having swings from 8 in. to 10 in. Chicago Tool & Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill.

SAWING
No. C1117
Shell Stock
TECHNITE
CAPEWELL
Hack Saw Blades
Proved More Efficient
Another manufacturer has switched to Capewell. This plant's war work is the production of shells. The hack saw operation is set up to cut, at one time, 11 pieces of 2½" diameter No. C1117 solid shell stock. Because this plant was looking for larger weekly production, with less shut-down time for blade changing, the officials ran a comparative test. The result: Capewell's Technite hack saw blade was found superior. Do you also wish to improve hack saw production? Simply talk to your local Capewell distributor.
CAPEWELL
HACK SAW BLADES
The trend is to TECHNITE
the molybdenum high speed hack saw blade
THE CAPEWELL MFG. CO.
Hartford, 2, Conn.

Motors — Three bulletins describe and give dimensions of small motors in two shell diameters: Bulletin 10-A deals with a.c. shaded-pole types without radio interference; Bulletin 10-B covers universal and direct current motors; Bulletin 10-C is devoted to smooth and quiet motors which are reversible and can be varied in speed. Robbins & Meyers, Inc., 1934 Clark Blvd., Springfield, Ohio.

Motor Maintenance — Form MMH-645 of 36 pages illustrates and describes the many types of equipment for maintaining commutators in excellent condition. Ideal Commutator Dresser Co., 1006 Park Ave., Sycamore, Ill.

Plating—Three flyers, ball anodes, dipping baskets, and cathode rod agitator call attention to these pieces of equipment useful where maximum efficiency must be maintained. The Udylite Corp., 1651 E. Grand Blvd., Detroit 11, Mich.

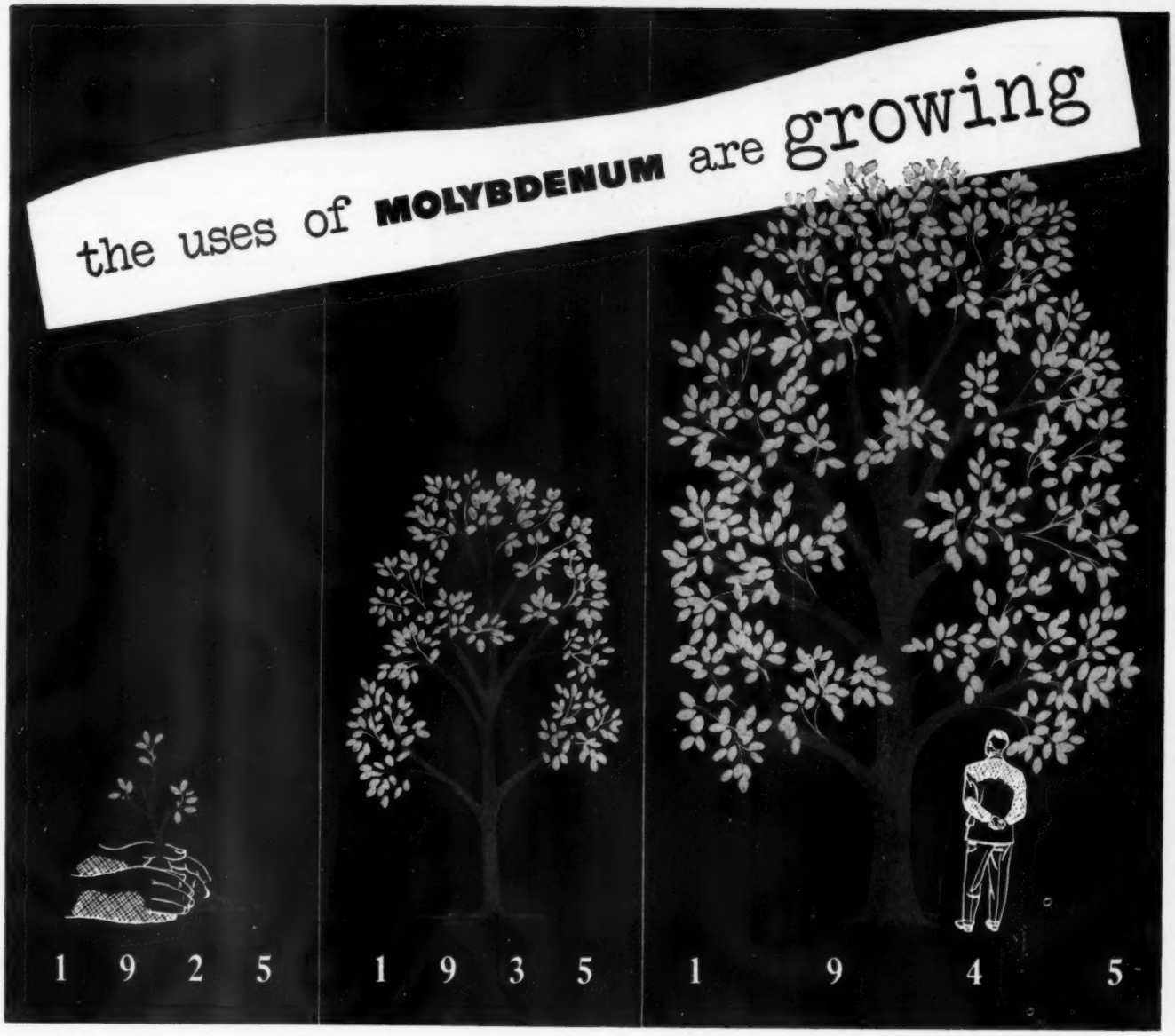
Quality Control—28-page booklet about "Dimensional Quality Control Primer" furnishes a practical discussion of the subject. Federal Products Corp., 1144 Eddy St., Providence 1, R. I.

Sawing — 48-page "Handbook of Metal Sawing" contains data about the proper types of blades for particular materials to be cut. The information is applicable to all makes of hack and band saws. W. O. Barnes Co., Inc., 1297 Cecil Terminal Ave., Detroit 14, Mich.

Screw Thread Inserts—Bulletin No. 237-A describes the application of Heli-Coil Spark Plug Bushings to automotive service. Aircraft Screw Products Co., Inc., 47-23 35 St., Long Island City 1, N. Y.

Sealer — Folder describes Sumtex MM-50 a non-settling, non-hardening sealer, unaffected by oils and acids and non-inflammable gasket sealer soluble in tetrachloride. Can be used in high temperature and pressure hydraulic systems. The Summit Paint & Varnish Co., 581-589 Windsor St., Hartford, Conn.

Seals—Folder describes carbon seals and rings for compressors, liquid and gas pumps, torque converters, meters, automotive and aviation devices where the retention of fluids



"All types of work will be included, but special emphasis will be on those using metals."

So reads a paragraph in a recent Government report. It relates to modernization of commercial buildings, but might apply as well to various departments of industry.

More use of metals. Better metals, of more specialized properties, for particular uses. More precise consideration of serviceability with a view to lower overall cost, in any given employment . . .

All this active search for better utilization of materials in post-war manufacture has enlarged and diversified the uses of Molybdenum. Knowledge of the possibilities is being rapidly advanced. The Molybdenum Corporation maintains a staff of technicians whose advice is often found helpful, and sends out informative literature on request. Inquiries on any proposed use of Molybdenum, Tungsten, or Boron will be welcomed.

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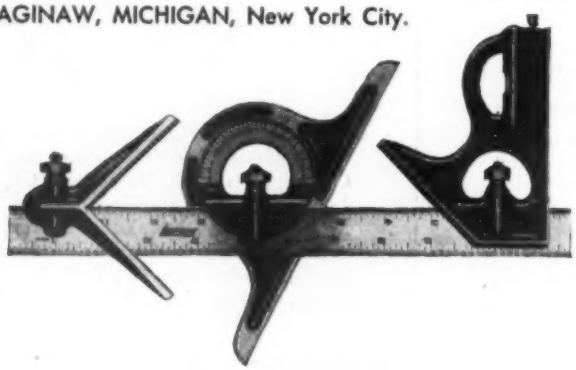
Lufkin Combination Sets for Dozens of Different Measuring Jobs

The number of uses for a Lufkin Combination Set is almost unlimited. With this handy tool you can determine and transfer height and depth measurements, lay out angles, or find the center of cylindrical stock. You can set up and square work for machining or checking, and use it in many other ways. Square and protractor head are equipped with level glass. Durably constructed and accurately machined and graduated to exacting Lufkin standards. Buy a Lufkin Combination Set at your dealer's. For free catalog write THE LUFKIN RULE CO., SAGINAW, MICHIGAN, New York City.



LUFKIN FOR ACCURACY

over a range of temperatures must be positive. Morganite Brush Co., Inc., 3300 Fourth Ave., Long Island City, N. Y.

Sheaves—Catalog section 2185 of four pages about fractional-horsepower, single and double groove sheaves, has tabulated engineering data for A and B belts. B. F. Goodrich Co., 448 S. Main St., Akron, Ohio.

Steel—A 96-page book "Eastern Stainless Steel Sheets" gives a pictorial review of the uses of stainless steel, its properties, corrosion resistance, data on gages, sizes and finishes and reference tables. Eastern Stainless Steel Corp., 122 Rolling Mill Ave., Baltimore 3, Md.

Steel—Folder DS113 about Airdi 150 tool steel shows the chemical composition, typical applications, forging and annealing practice and other types of treatment. A TTT curve shows the characteristics on cooling in air from 1800 deg. F. Crucible Steel Co. of America, 405 Lexington Ave., New York 17, N. Y.

Tools—Catalog 10 about "Aircraft Tools" and catalog 11 about "Machinists Tools and Gages" describe and illustrate numerous useful tools which can be used in many industries. Products Engineering Co., 9045 Wilshire Blvd., Beverly Hills, Calif.

Tools—General catalog of 26 pages which describes and gives dimensioned sketches of index fixtures, holding fixtures, speed chucks, broaching machines and fixture accessories for economical manufacture. Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio.

Tools—52 page booklet about Stellite metal-cutting tools describes high production tools made from Stellite 98M2 and Star J-Metal. There are engineering drawings, specifications and prices for standard tools, reaming blades, bits, tipped tools for turning, grooving and cutoff, shell mills, milling cutter blades, wear strips and other uses. Haynes Stellite Co., unit of Union Carbide & Carbon Corp., 30 E. 42 St., New York 17, N. Y.

Welding—Leaflet No. 345 gives the features of No. 300 electrode holder, and shows the disassembled parts, each one being named and priced for repairs. Chicago Tool & Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill.

FILES FOR DIES MUST BE RIGHT

Fitting tool-steel female punch die with a 10-inch Nicholson Round Smooth Cut File (illustrated)

RECONVERSION means busy days for the diemakers. And precision is one of the first rules in their highly specialized work.

Nicholson's study and manufacture of files for diemaking covers many years. We know the accuracy demanded — the cuts, shapes and *uniformity* required. Our service engineers are well qualified to recommend the right files for die jobs involving special problems. Nicholson co-operation is a helping hand that is always cordially extended to diemaking concerns and industrial managements in general.

A wide range of diemakers' files

Many Nicholson regular purpose files in the American pattern are suitable for finishing dies with liberal tolerances. Smooth and Second are the more commonly used cuts. For closer tolerances and intricate shapes, the slenderer, more pointed and finer cut regular types of Nicholson X.F. Swiss Pattern Files are available: and for small dies or extra-fine detail, Die Sinkers Files, Die Sinkers Rifflers and Round Handle Needle Files comprise a wide assortment of special shapes and sizes in the famous Nicholson X.F. Swiss Pattern line.

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HOW TO RELOCATE AND FINISH GRIND HOLES TO .0001" IN 1/3 THE TIME

NO LONGER is it necessary for toolmakers to labor over buttons and locating plugs to correct holes in hardened parts... not if you use the Moore Jig Grinder.

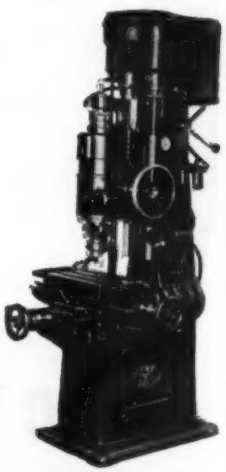
You can rely entirely on this unique machine to *mechanically* relocate and finish-grind straight or tapered holes to exact size and location in 1/3 to 1/4 the time required by conventional methods.

Accurate lead screws built into the Jig Grinder enable operators to guide the work rapidly to precise location within .0001" at the turn of the micrometer dials. This eliminates hours of checking on the bench and surface plate.

Working *to figures instead of to "fit,"* the Moore Jig Grinder takes die-making out of the "one-man" class and puts it on an interchangeable parts and assembly basis for the first time. Die, stripper and punch plates can now be produced concurrently with better alignment of mating parts and more uniform clearance between punch and die. Multi-section dies are quickly ground in *a single set-up*... eliminating separate-section hole grinding and the accompanying problems of accurately locating each section in the die bed.

MOORE SPECIAL TOOL CO., INC.
738 UNION AVENUE, BRIDGEPORT 7, CONN.

NEW 28-PAGE CATALOG describes Moore Jig Grinder's application to dies, drill jigs, gage parts, master plates and production parts.



MOORE TOOLS

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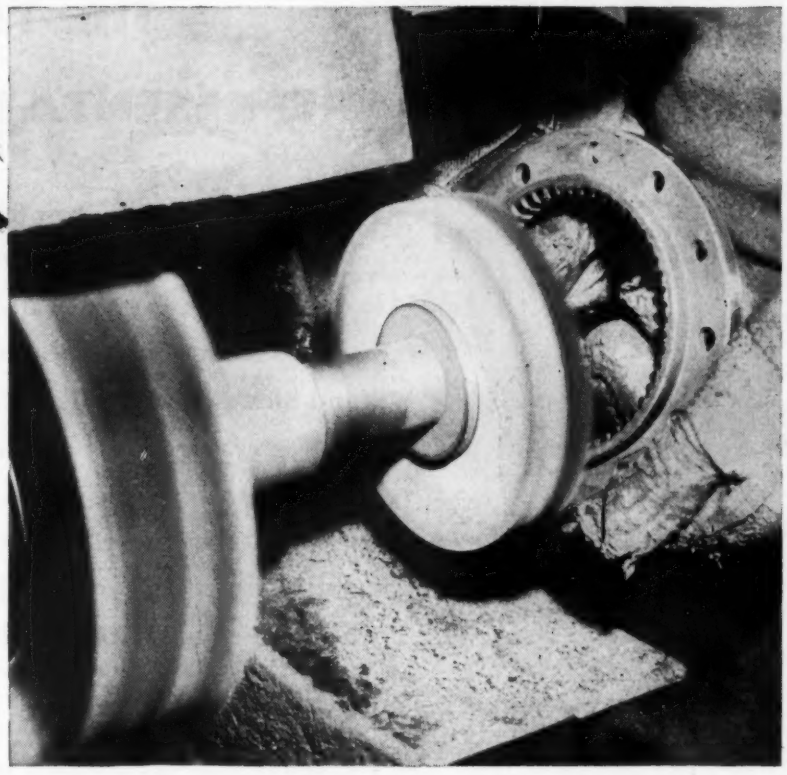

Internal ring gear teeth need polishing too!

A LEADING Detroit automotive manufacturer knows that the way to make motors sit up and behave while they got their gear teeth cleaned is to do the job with Osborn Fascut Sections.

In the illustration above an operator is using this fast-polishing, treated tampico brushing tool to do uniform, thorough work—in a fraction of the time, at a fraction of the cost. Note that by using a brush slightly larger than the gear diameter, no oscillation is necessary, thereby saving still more time.

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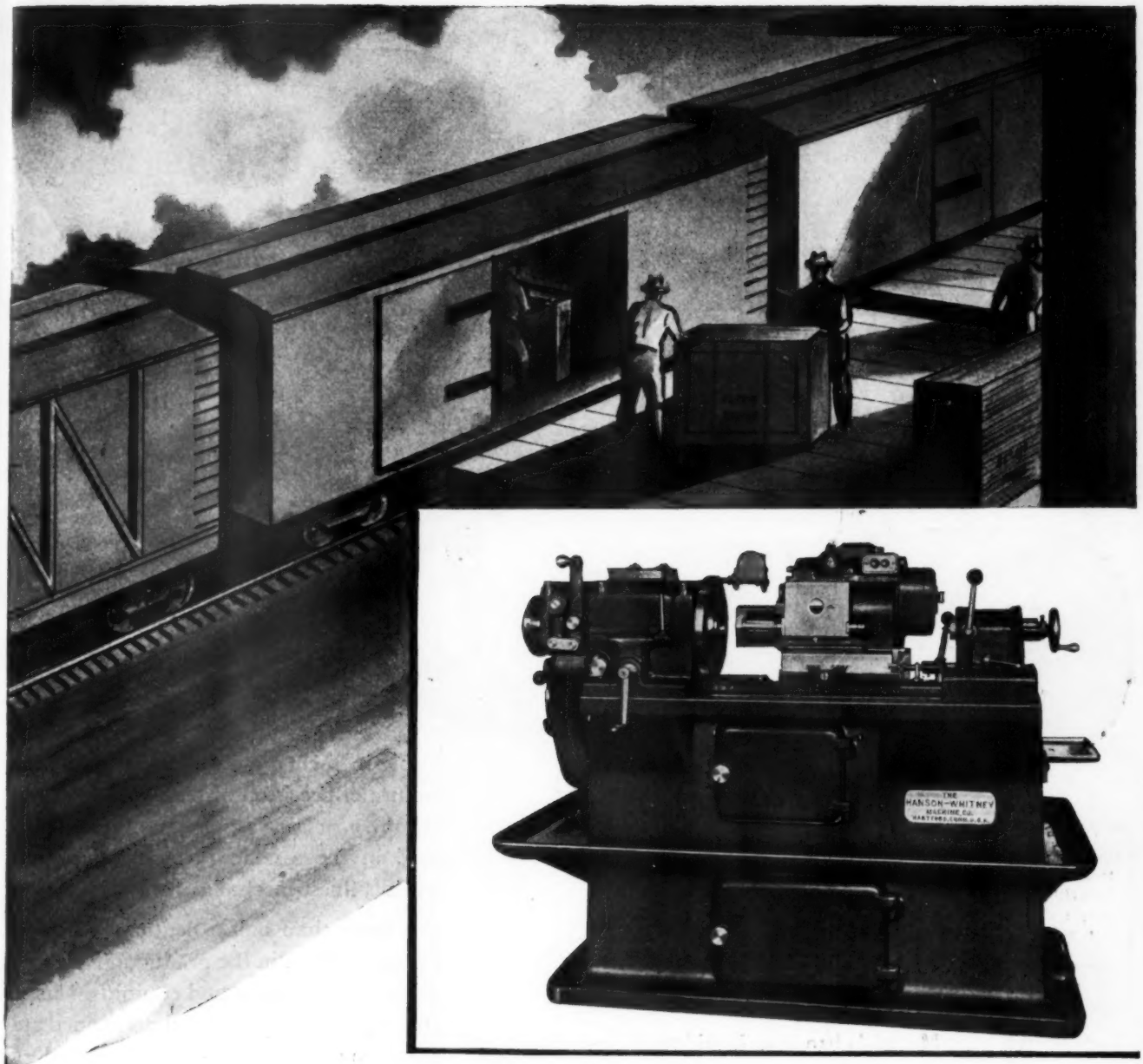

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For more than half a century Waltham has specialized in the production of *precision* screws. Its plant and equipment have steadily modernized and expanded to meet the demands of every period of business development and the exacting needs of three wars.

Waltham is tooled to produce fine screw machine products *for a million uses* — any thread, material or finish — any type head, from 1/64" to 1½" diameter.

America's Outstanding Producers of Fine Instrument Screws

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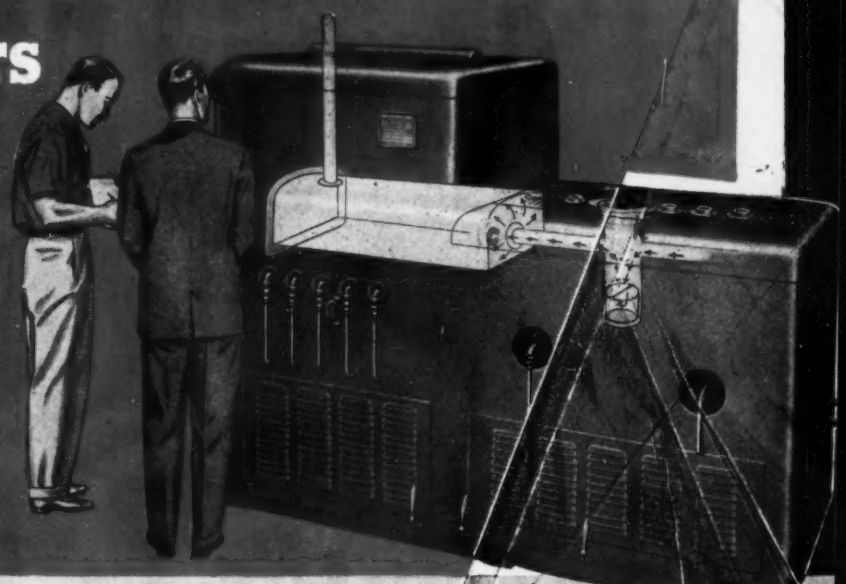
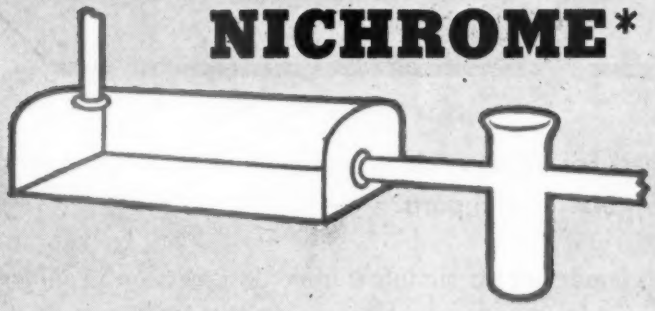
Furnace operates continuously for two years WITHOUT A SHUTDOWN!



Thanks to DRIVER-HARRIS NICHROME*



Phantom view shows the general shape of the Nichrome muffle employed in the Lithium Furnace. In this type high heat carburizing is performed. Cracked Propane gas is introduced through the tube "A". It flows into the Lithium generator at "B". There Lithium vapor is entrained by the carrier gas and enters the carburizing chamber at "C". The Nichrome Muffle weighs 953 lbs., is 24 inches wide, 14 inches high and 6½ feet long—is still in service.

There are few places where it is more important to avoid work interruptions and tie-ups than in heat-treating the component parts of aircraft engine super-chargers. That is why the performance record of the Nichrome muffle of this Lithium furnace made by the Lithium Corporation, Newark, N. J. is so remarkable. On a round-the-clock schedule, *it operated two years without a shutdown.*

This is not so amazing when you look at the 28 years' record of Nichrome performance. Recognized the world over for its unexcelled heat-resisting properties, this exclusive Driver-Harris Alloy delivers long hours of dependable, economical service where other alloys have failed.

For conventional applications requiring heat-resisting castings, Nichrome is unsurpassed . . . for extraordinary applications it is indispensable. If you are not entirely familiar with the excellent properties of Nichrome write for a copy of the latest Driver-Harris Heat-Treating Fixture Catalog.

*Trade Mark Reg. U. S. Pat. Off.

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The Pressed Metal Institute is a nationwide association of leading pressed metal manufacturers, organized to advance the art and to assist other industries to take full advantage of latest stamping methods and techniques.

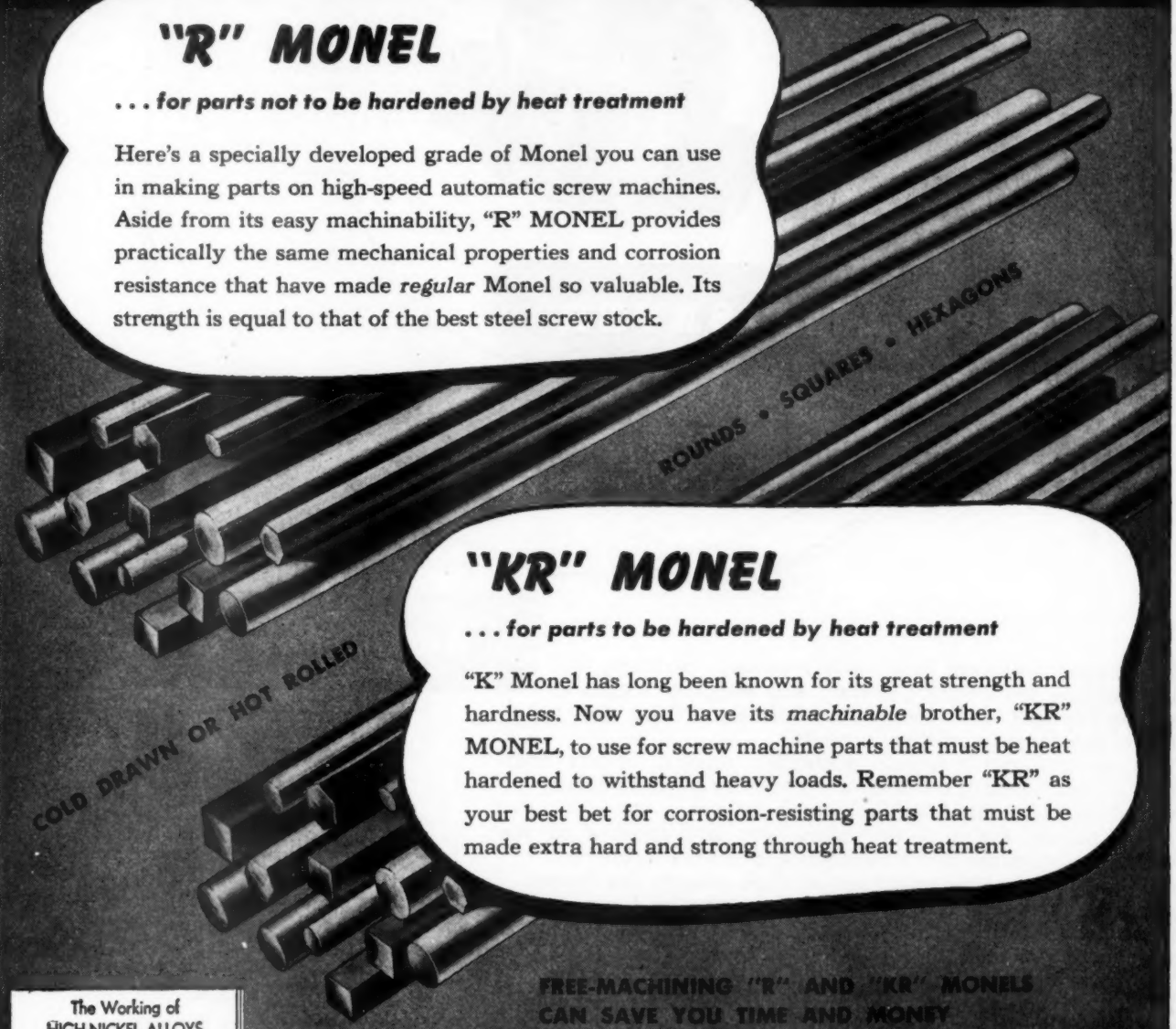
Two FREE-MACHINING MONELS

answer your need for strong, tough, rust-proof screw stock

"R" MONEL

. . . for parts not to be hardened by heat treatment

Here's a specially developed grade of Monel you can use in making parts on high-speed automatic screw machines. Aside from its easy machinability, "R" MONEL provides practically the same mechanical properties and corrosion resistance that have made *regular* Monel so valuable. Its strength is equal to that of the best steel screw stock.

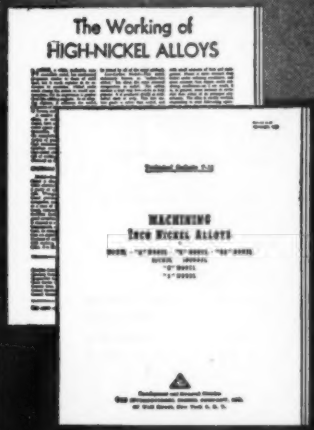


"KR" MONEL

. . . for parts to be hardened by heat treatment

"K" Monel has long been known for its great strength and hardness. Now you have its *machinable* brother, "KR" MONEL, to use for screw machine parts that must be heat hardened to withstand heavy loads. Remember "KR" as your best bet for corrosion-resisting parts that must be made extra hard and strong through heat treatment.

FREE-MACHINING "R" AND "KR" MONELS CAN SAVE YOU TIME AND MONEY



MACHINING TECHNIQUES for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. Write for your copy. Handy, too, is the reprint, *"The Working of High-Nickel Alloys."*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.
Gentlemen: Please send me

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- ☐ a copy of "The Working of High-Nickel Alloys"

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Duties.....*Title*.....

A. M. 9-45

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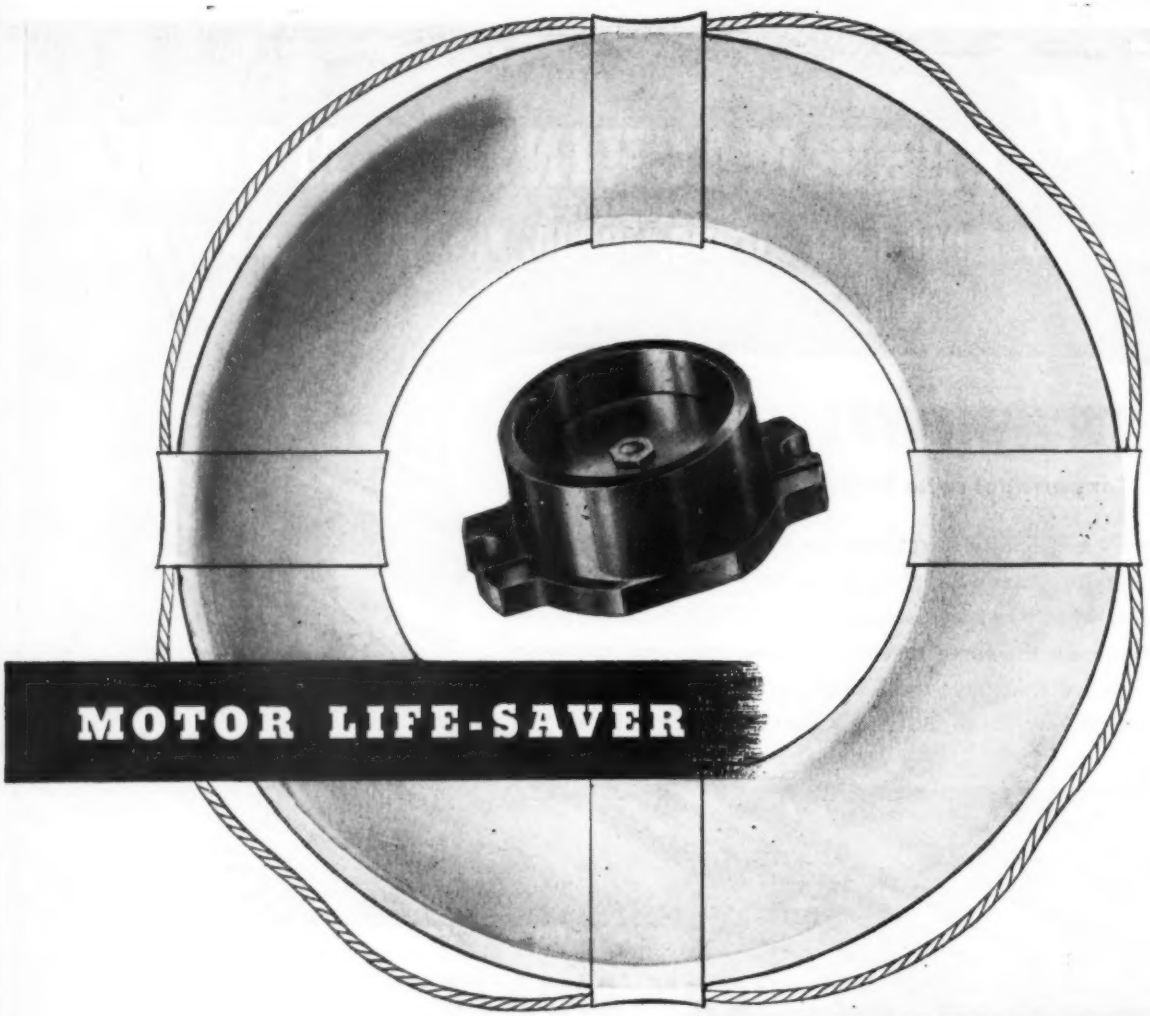


MOTOR LIFE-SAVER

Continuous overloads, frequently repeated overloads, low line voltage, too frequent starting and stopping, excessive ambient temperature, mechanical failure . . . these are just a few of the causes of motor burnouts.

Yet you can get complete protection against motors overheating and burning out from any cause by buying motors with built-in Klixon Motor Protectors.

These simple, foolproof protectors take into account all the variables that cause motor burnouts and cut the motor "off" the line whenever the motor temperature reaches the danger point. Because they are built into the motor by the motor manufacturer, you get a tested and proved combination of motor and protector.

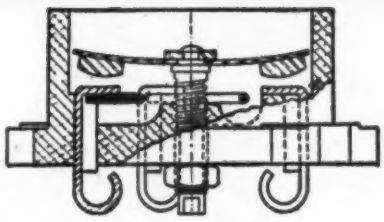
The extra cost for ordering motors with Klixon Protectors is low . . . quickly pays for itself over and over by preventing motor burnouts, reducing factory returns and minimizing motor repairs and replacements.

Specify Klixon Protectors with every motor you buy. They are available in manual or automatic reset types for A. C. motors all sizes; D. C. up to 30 volts. Bulletin PR-112 gives the entire story. Write for a copy.

KLIXON

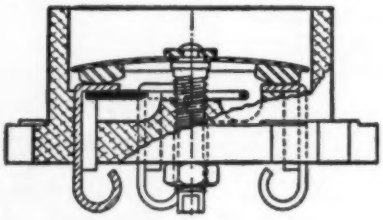
MOTOR PROTECTORS

Here's how it works



CLICK! IT'S OFF!

Should a motor become overheated and dangerously hot, the Klixon Protector snaps the power "off" preventing the motor from burning out.



CLICK! IT'S ON!

When the motor cools to safety, the Klixon Protector snaps the power "on" automatically if the automatic reset is specified . . . or when the reset button is pushed when manual type is specified.

SPENCER THERMOSTAT CO., ATTLEBORO, MASS.

LET ONE CALL DO IT ALL when you need STAINLESS

To speed your Stainless on the way... get Industrial on the wire!

You are assured of same-day attention to all your Stainless needs when you telephone *first* to Industrial . . . where America's largest, most diversified warehouse stock of Stainless Steels is instantly available.

If it's Stainless, Industrial has it . . . with the emphasis on prompt service. What's more, you pay no premium over mill prices, regardless of quantity.

Expert chemical, metallurgical, and engineering counsel is yours for the asking, too . . . if you have a Stainless selection or fabrication problem. Request help if you need it . . . and send for your free copy of the Industrial catalog. Industrial Steels, Inc., 250 Bent Street, Cambridge 41, Mass.

JLMCo CI-J2

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If you make or use Stainless parts, investigate the Stainless Surface Hardening Company's efficient new process. Gives up to 1100 Brinell surface hardness. Combines the corrosion resistance of Stainless with the abrasion resistance of a nitrided surface.

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Manufacturers of equipment, designed to operate in all kinds of weather, find bronze sleeve bearings add years of efficient service. In addition to performing all the functions of a bearing, they cannot rust . . . they do not disintegrate.

Alert manufacturers, looking for ways and means to improve their product will do well to consider bronze. Our engineers are ready to help you select the correct bearing for each application . . . the one that will give the greatest service . . . for the longest period of time . . . at the lowest unit cost. Why not write—TODAY?

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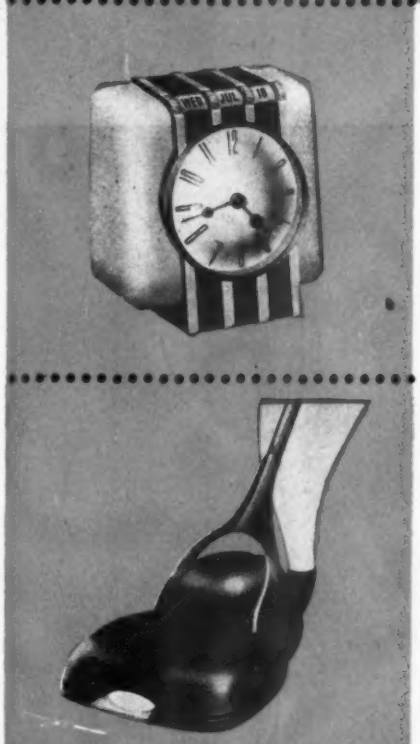

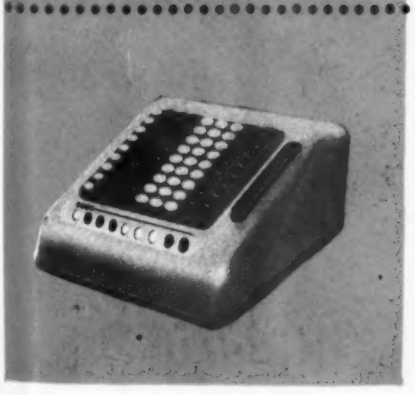

HOUSING PROBLEMS?

Here's your solution

HOUSING PROBLEMS are not the exclusive concern of architects and building contractors. Manufacturers and designers, too, are considering improved *housings* for the new products that are coming off the drawing boards . . . and are summing up now the many merchandising and manufacturing benefits they can gain by molding their cabinets, casings, and housings from sturdy, impact-resistant BAKELITE plastics.

Housings molded from BAKELITE plastics are dimensionally stable and resistant to wear and abrasion. Finish and color are self-contained. They provide excellent electrical and heat insulation, and the required structural strength to support interior mechanisms. And, previous limitations in designing plastic cabinets have been removed with the advent of the new heatronic molding technique – developed by Bakelite Corporation – that permits greater wall thicknesses, faster molding cycles, and easier molding of large parts on an economical basis. As a result, the scope of compression and transfer molding of BAKELITE plastics has been greatly broadened.

Redesigning with BAKELITE molding plastics can be an effective answer to postwar competition. Write Department 44 for booklet G-8, "A Simplified Guide to BAKELITE and VINYLITE Plastics." Also write for pamphlet describing heatronic molding.

TRADE (B) MARK

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Unit of
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BAKELITE MOLDING PLASTICS

TRADE-MARK

WHEN MACHINING COSTS

You need this Improved

MORE THAN MATERIAL...

MACHINABILITY

The sealing plug for aircraft hydraulic mechanisms at the left is a good example of what we're talking about. A lot of machining goes into its fabrication on hand screw machines and drill presses—machining which costs considerably more than the steel from which it is made.

That's why UNION SUPERCUT (A.I.S.I. B-1113) is used for this and countless other steel parts.

UNION SUPERCUT is an *improved* free-machining Bessemer Steel—improved not once but many times. It is the steel which, because of its high machinability, made necessary the redesign of automatic screw machines. It is the steel which for uniform machinability has led the field ever since it first was developed.

In the production of UNION SUPERCUT. UNION FREE CUT (B-1112) or any of the open-hearth or electric furnace grades produced by Union Drawn Steel Division, *MACHINABILITY* always gets top consideration.

As a result, speeds and feeds have been repeatedly increased, tool-wearing abrasives in the steel reduced and the smooth, bright machined surface improved. Because of the increase in machinability effected by furnace treatment, capacities for annealing, normalizing, spheroidizing, stress relieving and other heat treating have been expanded.

Whether you produce a complicated part like that at the left or one more simple in design, you need the improved machinability of Union Cold Drawn Steels to help you make better steel parts faster and at lower cost.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
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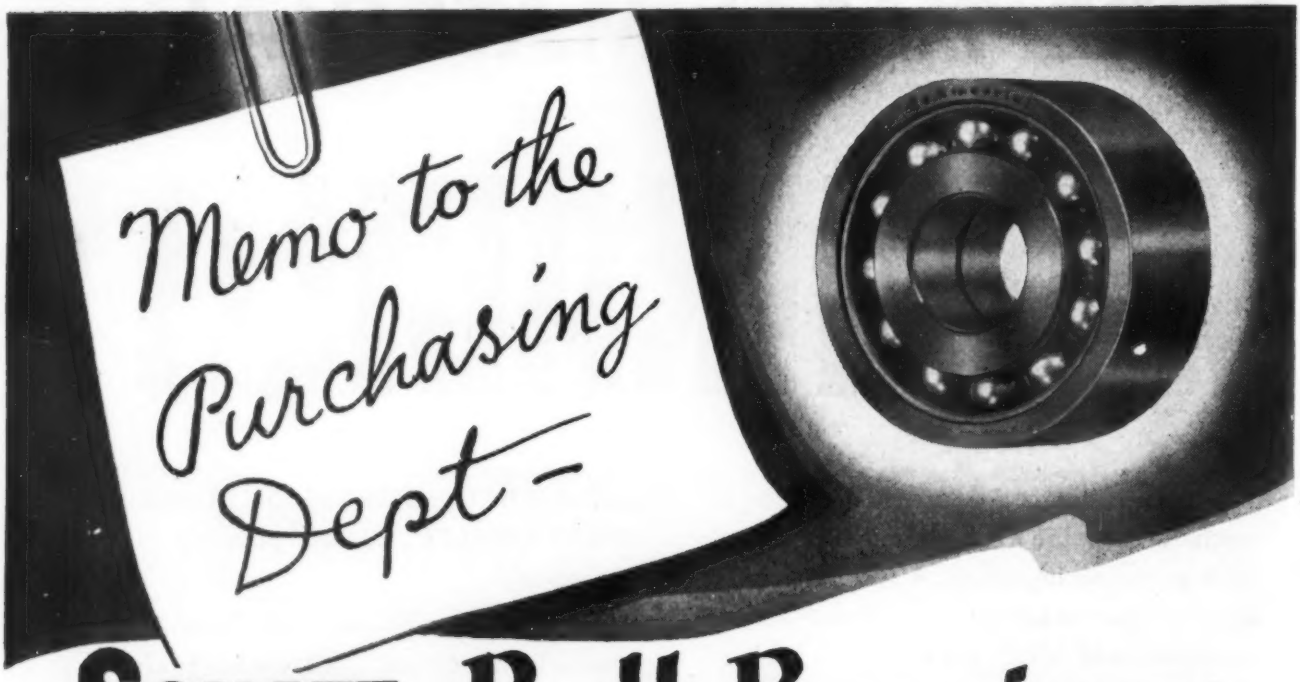
Union Cold Drawn Special Sections
•
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)



SCHATZ Ball Bearings Lower Costs!!

One sure way to reduce costs is to use Schatz "Commercial" Ball Bearings. "Commercials" are moderately priced—strong, sturdy, durable. Available in standard types and sizes, or made to your BP specifications—a complete ball bearing service for manufacturers in every industry.

SCHATZ "Commercial" BALL BEARINGS

Save time . . . save trouble . . . save money. **Use "Commercial" Ball Bearings in your plant, or product.**

THE SCHATZ MANUFACTURING COMPANY
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower—26 • Cleveland: 402 Swetland Building—15
Chicago: 902 S. Wabash Ave.—5 • Los Angeles: 5410 Wilshire Blvd.—36

In War... In Peace...

BECAUSE the vibrations of our modern industrial world, great as they are, have been greatly magnified by war—vibrations of mighty radial engines, of roaring Diesels, of deafening explosions, of cyclonic storms and bottomless jungle roads—Lord Manufacturing Company has added much to its store of knowledge concerning control and isolation of vibration. Because Lord had pioneered the field of vibration control for almost a generation, it was called upon for thousands of installations, from Lord Dynafocal Suspension for radial engines to mounts for delicate instruments in the ships that sail the air, the sea and the waters under the sea; for huge gun recoils and precise bomb sights; for more uses than we have space for or are allowed to mention.

Victory over vibration in war applications has paved the way for better control and isolation of vibration in a myriad of peacetime applications. Whether you manufacture locomotives or baby carriages, dynamos or television sets, turret lathes or laboratory recording instruments, Lord engineers can help you make a product that will serve better and last longer.

Lord Bonded Rubber Mountings are made in two main types, Tube Form and Plate Form, with variations to meet special conditions, and problems arising from internal or external vibration. Lord Mountings are made for load ratings ranging from a few ounces to several thousand pounds. Installation of Lord Mounts is extremely simple, no special tooling or machining being necessary to adapt them to your designs.

Send for the latest Lord literature on Vibration Control and Isolation, or call in our engineers to consult with you on your problems. Neither service entails any obligation.

IT TAKES **BONDED RUBBER** *In Shear* **TO ABSORB VIBRATION**

★ ★

BUY WAR BONDS

★ ★

LORD MANUFACTURING COMPANY

ERIE, PENNSYLVANIA

SALES REPRESENTATIVES
NEW YORK - - 280 MADISON AVE.
CHICAGO - 520 N. MICHIGAN AVE.
DETROIT - - 7310 WOODWARD AVE.
BURBANK, CAL. - 245 E. OLIVE AVE.
CANADIAN REPRESENTATIVES
RAILWAY & POWER ENGINEERING CORP., LTD.
TORONTO, CANADA

Originators of Shear Type Bonded Rubber Mountings

COMPARED to the cost of most machines, the cost of the bearings is slight. But the machine user or maker who overlooks the importance of choosing reliable bearings of proper design will pay a high price in damaged machines, production delays and lost customers.

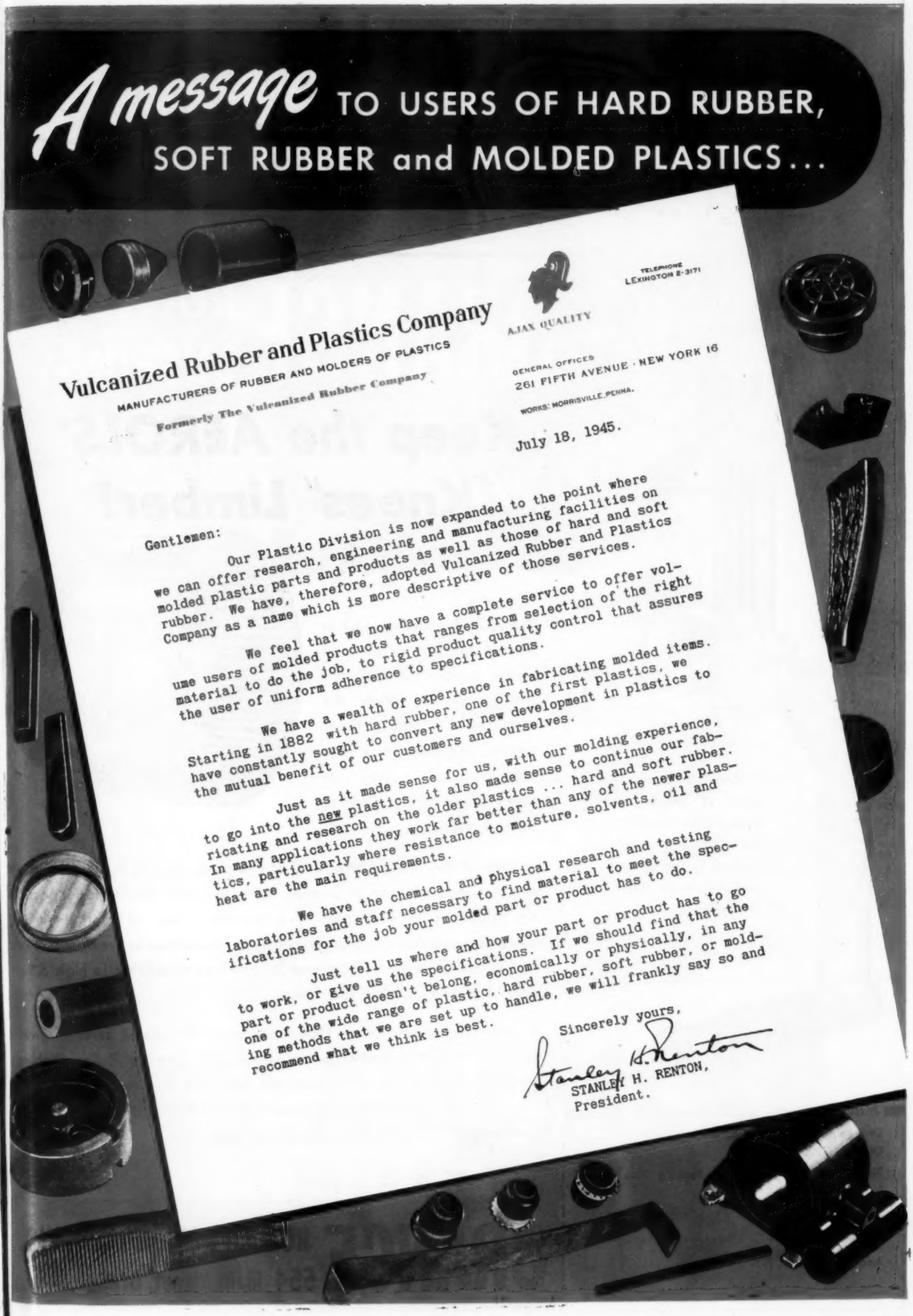
Every BCA Ball Bearing is designed for function. The reputation of its maker has been established for almost half a century. In the engineering of every type of BCA Ball Bearings . . . radial, thrust, angular contact . . . all factors of load, shock and speed have been carefully considered. We will gladly help you select the bearings best fitted to your requirements.

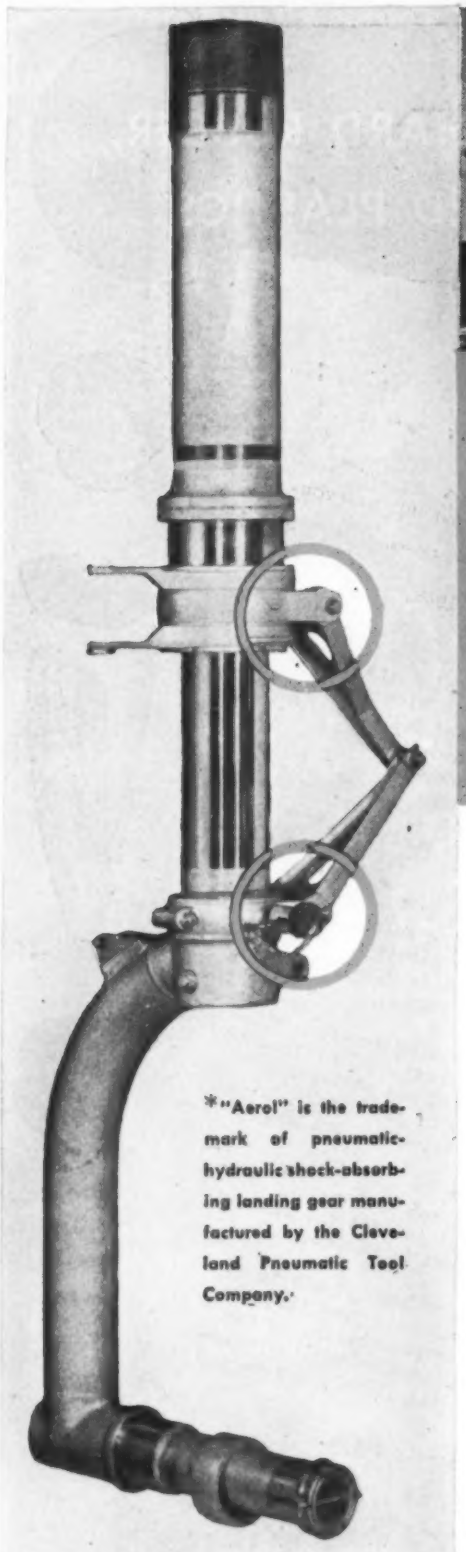
BEARINGS COMPANY OF AMERICA
LANCASTER, PENNA.

BCA

RADIAL • ANGULAR CONTACT • THRUST

BALL BEARINGS

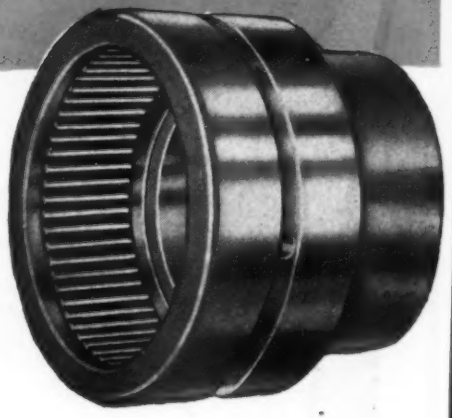

A message TO USERS OF HARD RUBBER, SOFT RUBBER and MOLDED PLASTICS...
Vulcanized Rubber and Plastics Company
MANUFACTURERS OF RUBBER AND MOLDERS OF PLASTICS
Formerly The Vulcanized Rubber Company
AJAX QUALITY
TELEPHONE LEXINGTON 2-3171
GENERAL OFFICES
261 FIFTH AVENUE · NEW YORK 16
WORKS: MORRISVILLE, PENNA.
July 18, 1945.
Gentlemen:
Our Plastic Division is now expanded to the point where we can offer research, engineering and manufacturing facilities on molded plastic parts and products as well as those of hard and soft rubber. We have, therefore, adopted Vulcanized Rubber and Plastics Company as a name which is more descriptive of those services.
We feel that we now have a complete service to offer volume users of molded products that ranges from selection of the right material to do the job, to rigid product quality control that assures the user of uniform adherence to specifications.
We have a wealth of experience in fabricating molded items. Starting in 1882 with hard rubber, one of the first plastics, we have constantly sought to convert any new development in plastics to the mutual benefit of our customers and ourselves.
Just as it made sense for us, with our molding experience, to go into the new plastics, it also made sense to continue our fabricating and research on the older plastics ... hard and soft rubber. In many applications they work far better than any of the newer plastics, particularly where resistance to moisture, solvents, oil and heat are the main requirements.
We have the chemical and physical research and testing laboratories and staff necessary to find material to meet the specifications for the job your molded part or product has to do.
Just tell us where and how your part or product has to go to work, or give us the specifications. If we should find that the part or product doesn't belong, economically or physically, in any one of the wide range of plastic, hard rubber, soft rubber, or molding methods that we are set up to handle, we will frankly say so and recommend what we think is best.
Sincerely yours,
Stanley H. Renton
STANLEY H. RENTON,
President.



*"Aerol" is the trademark of pneumatic-hydraulic shock-absorbing landing gear manufactured by the Cleveland Pneumatic Tool Company.

ORANGE ROLLER BUSHINGS

Keep the AEROLS* "Knees" Limber!



The A-26 Invader's combination of bomber weight and fighter speed produces terrific landing impact. While the nose "Aerol" Landing Gear cushions this great force in a billowy air-oil mixture, its brace flexes on four Orange Roller Bushings.

In spite of the heavy shock load at this point, aircraft compactness and precision are achieved in Orange Roller Bushings. This is made possible by holding roller clearances to a minimum. Thus, all internal running clearances are closer and true alignment is maintained between rollers and highly finished raceways. Extreme precision manufacturing to high dimensional uniformity, permits this design.

If your product encounters high shock loads or rugged service, give it longer life and smoother performance with Orange Roller Bushings. Available in a full range of sizes and types for most requirements. Send coupon for Engineering Data Book showing design, sizes, capacities, installation data, etc.

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc., AM
Orange, N. J.

Please send me your Roller Bushing Data Book.

Name.....Title.....

Company.....

Address.....

City.....State.....

ARMY E NAVY

ORANGE ROLLER BEARING CO., INC.
554 Main Street, Orange, N. J.

NOT WANTED

"JACK THE RIPPER"

Unwanted in any shop because of broken heads... slow work... quick temper... wasted screws... and, worst of all, *ripped-up work.* As long as he stays on slotted screws, *he can't help it if his driving stays crooked!*

...but he'll GO STRAIGHT if you'll give him

AMERICAN PHILLIPS SCREWS

You can't blame a good man for going wrong with slotted screws. For if he drives **one** straight, it's mostly by sheer accident and main strength.

But give this same man a fistful of American Phillips Screws... and a power driver with a 4-winged Phillips bit... *and you've got a new man entirely.*

His output will speed up as his confidence builds up... as he finds that he can drive American Phillips Screws *no way BUT straight*... as he finds the 4-winged driver can't twist out of the tapered recess, can't rip up the work-surface or burr the screw-head.

He finds, too, that *American* Phillips Screws are 100% fit for duty... and that's because of American's 4 inspections that assure a higher "perfection-percentage" in every shipment.

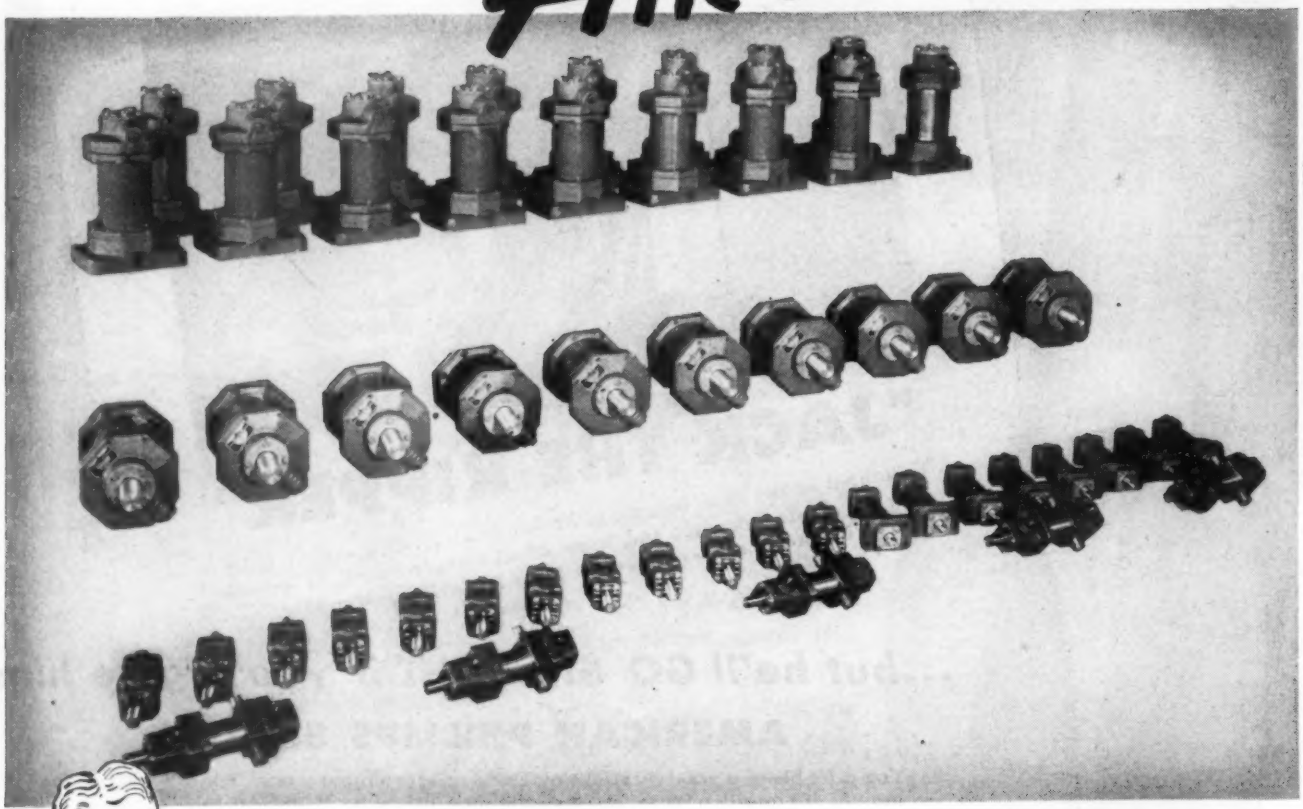
RESULT: Total time-savings as high as 50%... plus important savings in screws and materials.

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

THESE GEROTOR AIR CYLINDERS



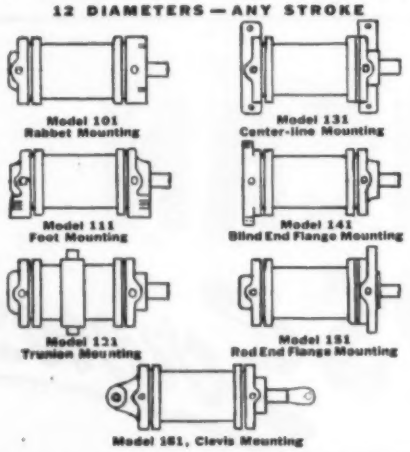
*Name on request.

—ARE ALL GOING TO ONE CUSTOMER*

You, too, can profitably standardize on

GEROTOR AIR CYLINDERS

7 STANDARD MOUNTINGS
12 DIAMETERS—ANY STROKE



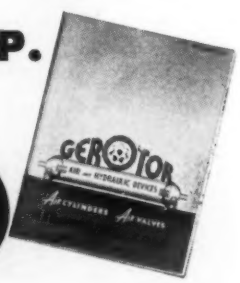
- Compact design
- Self-sealing packings
- Rust resistant
- Any length cushioning available
- No tie rods
- Designed for 150# air and 300# oil and water service
- Large pipe connections rotatable to any position.

GEROTOR MAY CORP.

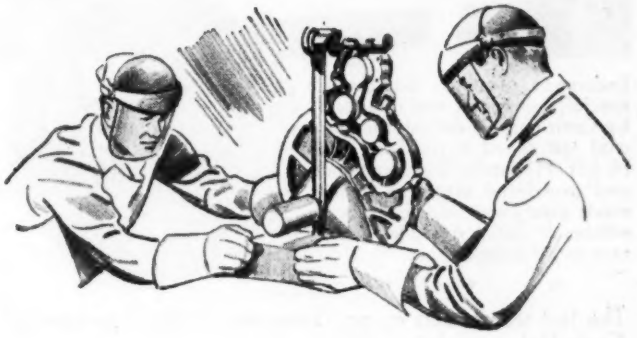
PLANTS—BALTIMORE, MD., LOGANSPORT, IND.

LOGANSPORT, INDIANA

SEND FOR CATALOG



Production men who know magnesium know it is easy to work



Through good shop practice they speed production of new lightweight products

Go to the men in the shops . . . the production men who work with magnesium . . . if you want the real down-to-earth story of its unusual machinability and exceptional ease in working.

They will tell you how magnesium—the lightest of all structural metals—saves time and labor and tools. They will describe its easy sawing, with band and circular saws and also hand and power hack saws, permitting larger cuts per tooth than other structural metals.

And these production men will tell you, too, that magnesium is worked faster and easier than most metals by hand tools—such as chipping tools, drills, burrs, chisels, planes, portable milling cutters.

Shop techniques have, in fact, been developed for all common fabrication methods to speed the output of new products of lightweight magnesium.

Dow men thoroughly familiar with these operations are on call to consult with you at all times.

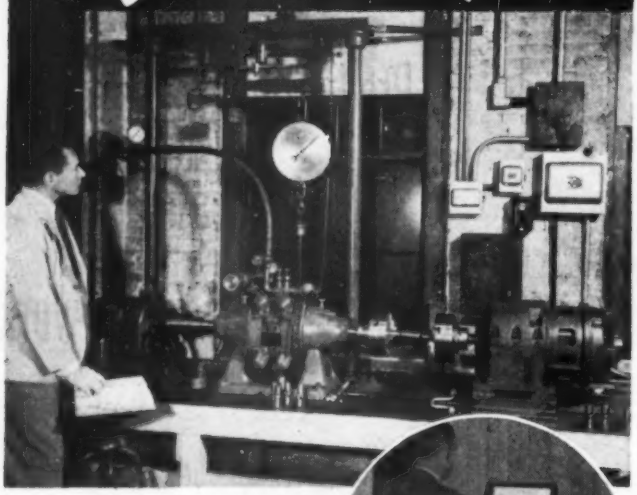
MAGNESIUM

THE METAL OF MOTION

MAGNESIUM DIVISION, THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • St. Louis • Chicago • Houston • San Francisco • Los Angeles • Seattle

UNIVERSAL JOINT *Life Insurance*



Endurance Testing Equipment specially designed and arranged by Curtis cancels out rotor inertia until test speed is reached. The Hi-EFF Hydraulic Dynamometer and associated electrical instruments give exact endurance and efficiency data, operating from zero to 40 degrees.

• • •

The test shown acts as an "Insurance Policy" to users of Curtis Universal Joints . . .

We designed this special equipment to enable us to know exactly the life endurance and efficiency of Curtis joints operating at any angle.

Such complete laboratory tests INSURE YOU of having a product that meets, and in most cases surpasses, your requirements for strength, durability, smooth operation and low maintenance.

Curtis Universal Joints have proved the value of such careful checking in thousands of installations in planes of all types, machine tools and special applications.

• • •

Curtis Laboratory testing is most complete, and efficiently controls the QUALITY of every Universal Joint that carries our trademark.

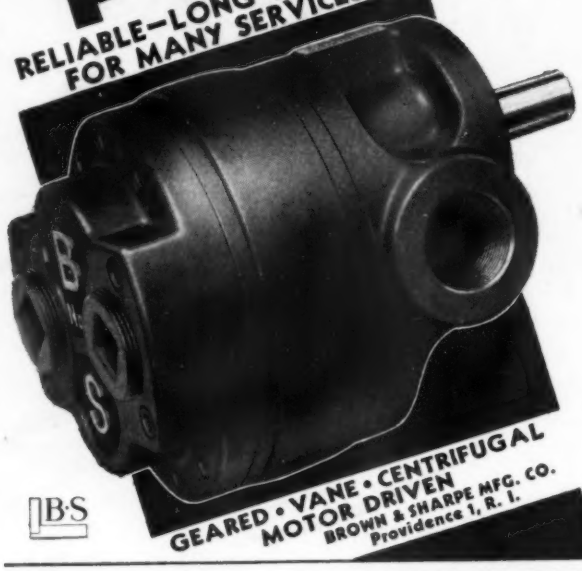
Write for technical data and useful Engineering Templates.

CURTIS UNIVERSAL JOINT CO. INC. SPRINGFIELD MASS.

SOLE DISTRIBUTORS, BOSTON GEAR WORKS, NO. QUINCY, MASS.

PRECISION BUILT **PUMPS**

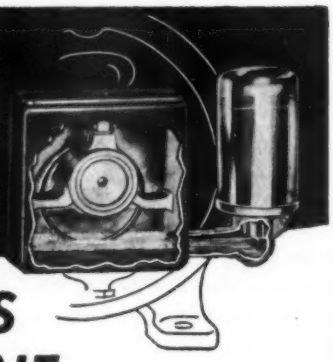
RELIABLE—LONG WEARING FOR MANY SERVICES



GEARED • VANE • CENTRIFUGAL
MOTOR DRIVEN
BROWN & SHARPE MFG. CO.
Providence 1, R. I.

BROWN & SHARPE PUMPS

OIL LEVEL



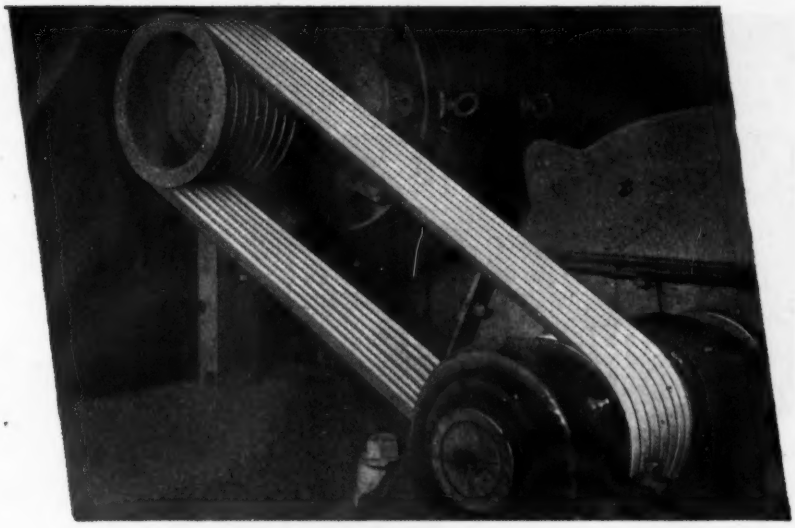
ALWAYS CONSTANT

As long as you keep oil in the unbreakable, transparent reservoir you know your bearings are getting just the right amount of oil. This Gits engineering achievement will not permit either starving or flooding of bearings. Easy to fill—oil reservoir tilts back on hinge—content of reservoir is always clearly visible. Also available with bayonet type reservoir. Send us an outline of your problem for Constant Level Oiler recommendations

Write for your copy of 172 pages of lubricating data.

GITS BROS. MFG. CO.

1857 South Kilbourn Avenue • Chicago 23, Illinois



No "Pre-War" Belts EVER Gave the Service that is

NOW Being Delivered by Your Standard GATES VULCO ROPES!

Here is the Reason:— Good belts were built before the war but none of them had the strength and durability found necessary on army tanks, tractors and self-propelled big guns. Gates developed these greatly superior V-belts for combat service—and here is why this fact is important to you NOW:—

Every improvement developed by Gates for U. S. combat units has been added, day by day, to the quality of the standard Gates Vulco Ropes which have been delivered to you.

Here is one rare instance in which improvements developed primarily for army combat use can be passed on to you immediately—and there are, of course, good reasons why Gates has not been called upon to withhold these important improvements from industrial V-belt users.

Efficient production in our nation's industrial plants is a prime essential to our winning of the war—and better V-belts than ever before have been urgently needed to keep machines going on the forced-draft, war production schedules that have had to be maintained 24 hours a day!

That is why Gates has been able to embody in the standard Gates Vulco Rope every V-belt improvement which Gates specialized research has developed for use on the Army's motorized equipment—and that is why you are finding that your standard Gates Vulco Ropes are today giving you better service than any V-belts that were built before the war.

All Gates V-Belts are Built with *The Patented*

Gates THE MARK OF SPECIALIZED RESEARCH

459

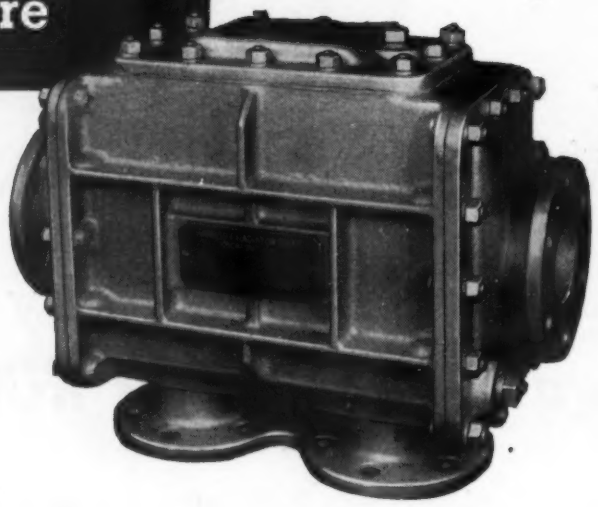
THE GATES RUBBER COMPANY

Engineering Offices and Jobber Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

CHICAGO 6, ILL., 549 West Washington. NEW YORK CITY 3, 215-219 Fourth Avenue. ATLANTA 3, GA., 521 C. & S. Nat'l Bank Bldg.
LOS ANGELES 21, CAL., 2240 E. Washington Blvd. DENVER 17, COLO., 999 S. Broadway. DETROIT 2, MICH. 223 Boulevard Bldg.
PORTLAND 9, ORE., 333 N.W. 5th Ave. DALLAS 2, TEXAS, 1710 N. Market St. SAN FRANCISCO 3, CAL., 170 Ninth St.

HARRISON
OIL COOLERS
Control Lube Oil Temperature



LESSEN WEAR—INCREASE EFFICIENCY

Production men know that Harrison oil coolers increase machine efficiency by maintaining lube oil temperatures within the range required for proper lubrication.

Properly cooled oil prevents excessive wear on bearings and other critical parts, and results in less time out for costly overhauls.

Harrison oil coolers, designed in types and sizes for practically every industrial application, contribute much to machine efficiency through effective temperature control.

Harrison engineers are available to work with you on problems of machine temperature regulation.

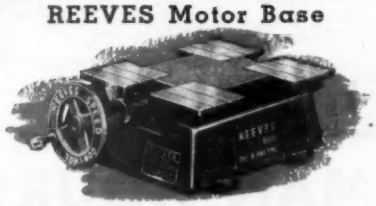
We Are At War—
BUY WAR BONDS

HARRISON

HARRISON RADIATOR DIVISION OF GENERAL MOTORS, LOCKPORT, NEW YORK

How to convert any standard constant speed motor to a Low Cost *Stepless Variable Speed Drive*

1 **Mount Your Motor on This REEVES Motor Base**



Base is built in wide range of sizes to fit any standard constant speed motor up to 15 h.p. Includes sliding platform and handwheel for moving motor forward or back.

2 **Apply This Disc Assembly to Motor Shaft**

Assembly consists of two facing cone-shaped discs, one stationary, the other sliding laterally, and compression spring for mounting on extension shaft of motor.

3 **Connect to Driven Machine With This Special V-Belt**

Place specially designed REEVES V-belt between discs and over pulley on power input shaft of the driven machine. Adjust belt to minimum center. Anchor motor base.

. . . and you have a

REEVES Vari-Speed Motor Pulley

available in sizes to 15 h.p. for stepless speed adjustability within 4:1 range.

HOW IT WORKS: The operation of a REEVES Motor Pulley is extremely simple—yet it follows the time-tested REEVES principle of a V-belt traveling between the adjustable driving diameters of cone-shaped discs. By turning handwheel, motor is moved forward or back on base, varying the driving diameters of the discs. As motor is moved toward driven machine, belt rides higher between discs, thus increasing the speed transmitted. Turning handwheel in opposite direction reverses the operation. Any speed within range is accurately maintained.

WHAT YOU CAN DO WITH IT: The REEVES Motor Pulley is the simplest dependable method of providing infinitely variable speed adjustability to a driven machine. With this low-cost, easy-to-install equipment you can transform a machine with fixed speeds into a far more versatile production unit—one that is instantly responsive to every changing condition and work schedule. Install REEVES Motor Pulleys on your machines in service, and when you buy a new machine, look for the familiar REEVES handwheel that signifies REEVES-equipped.

SEND FOR THIS CATALOG

New, 96-page book gives complete information on this and the two other basic REEVES Speed Control units—the Variable Speed Transmission and the Motodrive. Ask for Catalog AM-450.

REEVES PULLEY COMPANY, COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

Accurate Variable

REEVES Speed Control

Gives the Right Speed for Every Job!

You ask?

DOES ROTO-FINISH SAVE MAN HOURS?

A Roto-Finish user* answers: *"With one man, Roto-Finish de-burrs production of 34 automatic screw machines."*

The use of Roto-Finish — the proved mechanical de-burring method—has eliminated, in hundreds of plants, one of the great bottlenecks in modern production.

De-burring and finishing parts by hand is slow, not always too accurate, and requires a large labor force to keep up with the production rate of most machinery. In contrast, Roto-Finish processes quickly, and without loss of tolerance, enormous quantities of intricate castings and precision parts of steel, brass, aluminum, magnesium, stainless and nickel steels. It permits the utilizing of forming machinery at full capacity.

One operator can handle several Roto-Finish machines, allowing a tremendous saving in labor costs. Permits substituting skilled labor to more necessary jobs.

Investigate Roto-Finish fully, and send samples to us for processing. There's no obligation, and you will receive all information on costs, time and labor.

THE STURGIS PRODUCTS CO.,
510 Jacob Street, Sturgis, Michigan.

*Name on file.

ROTO FINISH
THE STURGIS PRODUCTS CO.

THE PROVED MECHANICAL PROCESS—

FOR GRINDING • DE-BURRING • POLISHING • HONING • COLORING

Of course it's Brass

FOR THE NAVY'S BIGGEST CARTRIDGE CASES

It's Brass because no other metal has such fabricating possibilities. The Norris Stamping and Manufacturing Company of Los Angeles has successfully produced thousands on thousands of these 38.2″-long cases for the Navy's newest and largest semi-fixed ammunition, servicing a light cruiser's main battery of 6-inch, 47-caliber guns.

The American Brass Company supplied the 31.5-pound discs for this job; 12.75″ diameter by .800″ thick, made of 70-30 Anaconda Cartridge Brass. Composition, dimensions and anneal were held to unusually close limits—determined by the operations shown in the cut-away sections below. Surface finish, too, was important, for the finished case had to be smooth and free from defects.

It's on jobs like this that The American Brass Company's "century of metallurgical experience" may mean the difference between an ordinary or an *outstanding* finished product.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

One of the many hydraulic presses used for drawing 38.2″-long brass cartridge cases for the Navy's 6-inch, 47-caliber guns. Norris Stamping and Manufacturing Company, Los Angeles.

ANACONDA

Anaconda Copper, Brass & Bronze

Only a pound of Brass...

but what an example of workability!

This assortment of bellows is typical of those made by The Fulton Sylphon Co., of Knoxville, Tennessee, for more than 40 years. Applications of such thin-wall metal bellows in pressure and thermostatic devices are well known—in mechanical refrigerators, heating systems, automobiles, Diesel and aircraft engines, etc. But their availability, in sizes from 15/32″ to 12″ diameter, is a tribute to manufacturing ingenuity and precision . . . and to Brass. For Brass is the metal used for the vast majority of Sylphon Bellows for widely different, but equally important reasons:

In service, Brass provides corrosion resistance and the high endurance limit necessary to resist millions of cycles of reversed stress.

In production, Brass provides a combination of metal-working properties unequalled by any other metal. Starting from a flat disc, the metal is subjected to a series of cupping and drawing operations to produce a thin-wall tube which is subsequently formed into a deeply corrugated, seamless, precision unit. The cumulative effect of this cold working enhances the physical properties of the metal and contributes long life and dependability to the finished bellows.

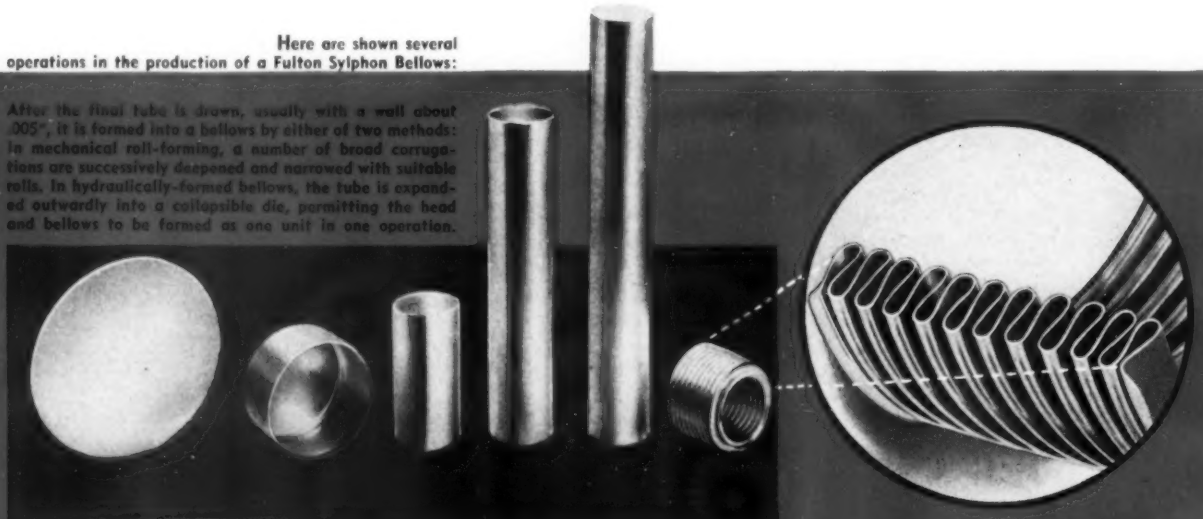
Knowing the fabricating operations involved, The American Brass Company supplies Brass, Phosphor Bronze and Beryllium Copper for Fulton Sylphon Bellows in the composition and form best suited to meet the unusually exacting requirements. 45159

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Here are shown several operations in the production of a Fulton Sylphon Bellows:

After the final tube is drawn, usually with a wall about .005", it is formed into a bellows by either of two methods: In mechanical roll-forming, a number of broad corrugations are successively deepened and narrowed with suitable rolls. In hydraulically-formed bellows, the tube is expanded outwardly into a collapsible die, permitting the head and bellows to be formed as one unit in one operation.



ANACONDA

Anaconda Copper, Brass & Bronze

GREAT
Things are Happening

IN THE ELIMINATION AND CONTROL
OF VIBRATION BY THE USE OF

TORFLEX flexible BEARINGS

Up until a few years ago, vibration was largely an uncontrolled, deadly force that shook, jarred, and deteriorated equipment in a relatively short time.

Harris Products Company pioneering in the field of engineered vibration control created, designed and introduced the new, widely used Torflex Flexible Bearings, the most scientific, effective method known for the control and elimination of vibration, noise, and excessive wear.

Torflex Flexible Bearings consist of a tube or ring of rubber stretched longitudinally between two concentric metal sleeves which prevent the rubber from returning to its original state. The pressure thus exerted by the rubber on the metal sleeves insures a high capacity mechanical bond between the rubber and metal under all operating conditions.

Torflex Flexible Bearings come in a wide range of sizes and have invaded many fields where vibration had caused havoc to equipment. They have controlled and eliminated vibration up to 90 per cent, thereby not only increasing the efficiency and performance of such equipment, but also greatly prolonging its useful life.

Torflex Bearings have done a remarkable job on military equipment such as tanks, tractors, and mobile units of all kinds. They are also used on many types of industrial equipment.

Our engineers know how, when and where to put Torflex Flexible Bearings to work advantageously. We would be glad to work on your problem, if you will just drop us a line.

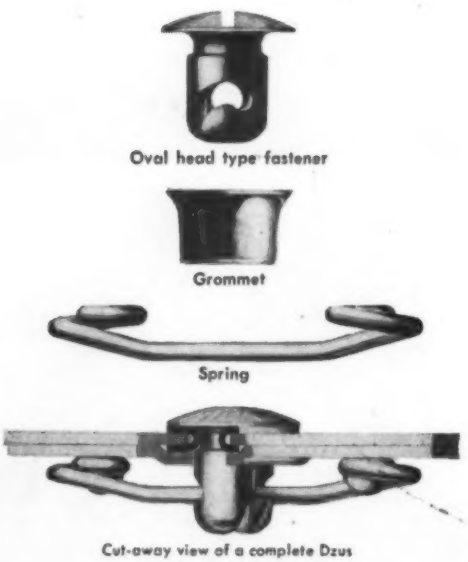
HARRIS PRODUCTS CO.
CLEVELAND 4, OHIO, U. S. A.

This safety guard can be removed in a second to adjust, change or repair the tool of the power press

A close-up view shows the simple attachment of the Dzus spiral cam fastener and how it is installed and operated

SAFETY FIRST *with* DZUS*

SPIRAL CAM FASTENERS



Oval head type fastener

Grommet

Spring

Cut-away view of a complete Dzus spiral cam fastener assembly

Vibration-proof, quarter-turn, self-locking Dzus fasteners are applied to machine guards, panels and plates to provide complete safety for machine operators and maintenance men. There are no loose parts because Dzus fasteners are permanently attached.

These easy to install, quick operating fasteners are positive in action, rugged, long lived, and are available in various sizes, head styles and materials.

Send for our catalog that contains full descriptions, specifications and many illustrated applications. No other fastener is so widely used wherever quick access is necessary on a hinged or removable part.

*The word Dzus is the registered trade mark of the Dzus Fastener Co., Inc.

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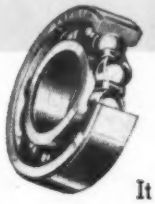
¼" holes in steel
SPEED...
up to 5000 RPM

COMPACT... LIGHTWEIGHT



It takes a lot of doing to put together a portable electric drill so it will drill ¼ inch holes in steel hour after hour, will run at speeds up to 5000 RPM without overheating, and will be COMPACT and LIGHT in WEIGHT.

At five vital spots in that drill, spinning shafts must be supported to carry the radial load of the motor armature and the reducing gears. Add to this the heavy thrust load of the operator who "leans" on the work, and, don't forget, the allowable space is measured in small fractions of an inch.

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FAFNIR BALL BEARINGS

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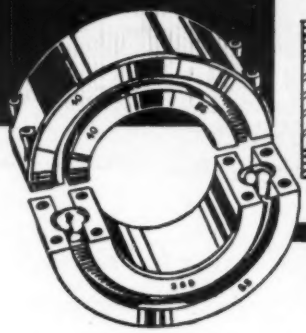

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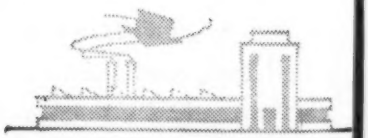

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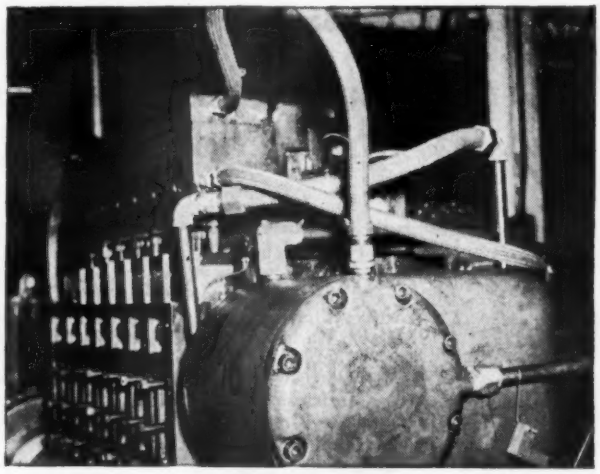

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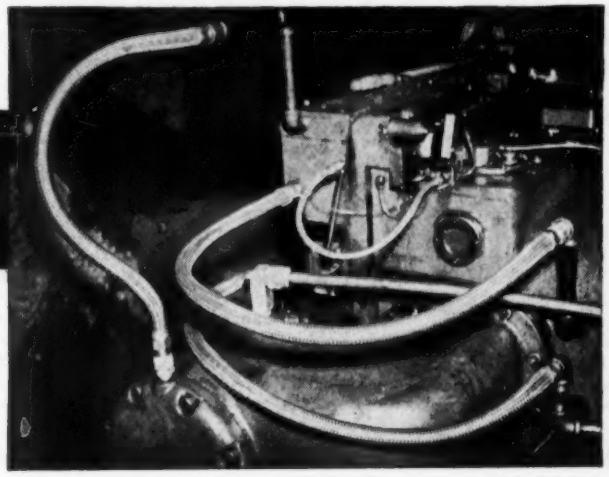

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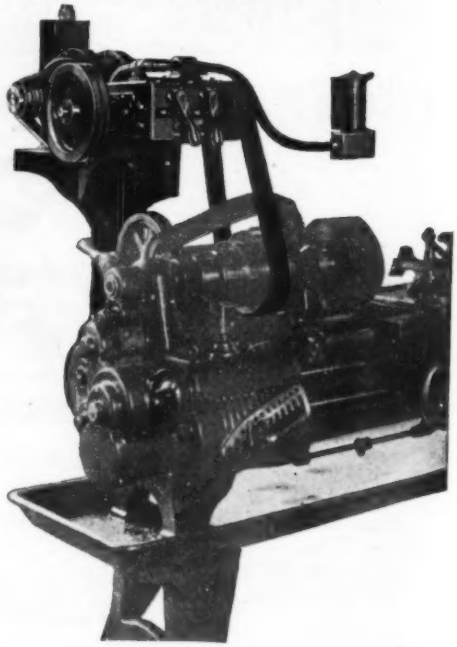

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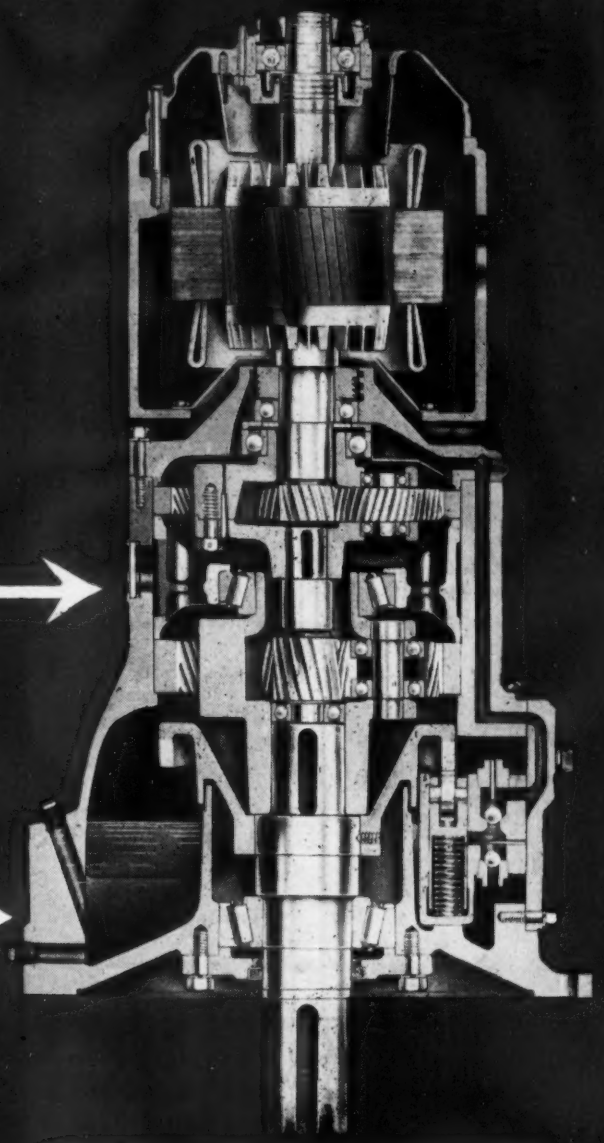

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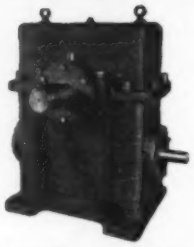

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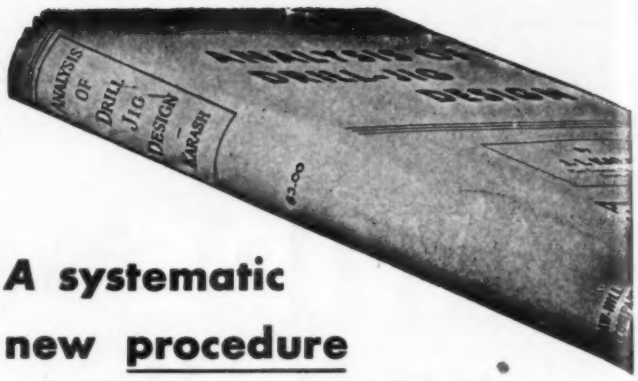

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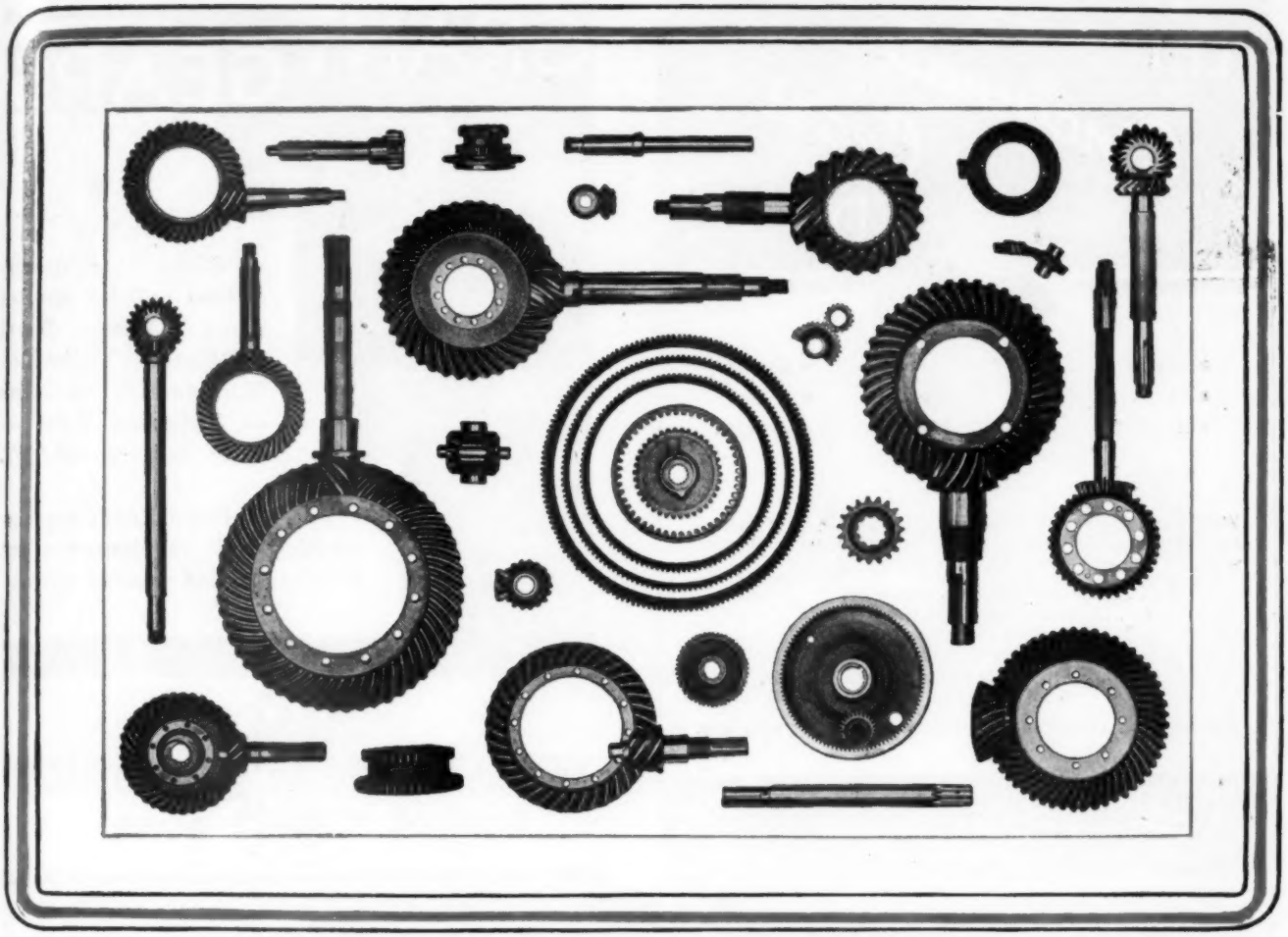

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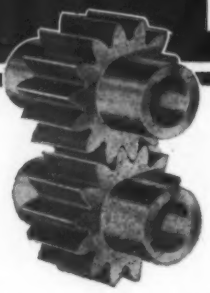

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With our exceptional facilities and skills in gear manufacture we safely extend to you the advantages that go with the use of *Gears, Good Gears Only*.

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We will appreciate the opportunity of working with you.

THE CINCINNATI GEAR COMPANY
"Gears Good Gears Only"
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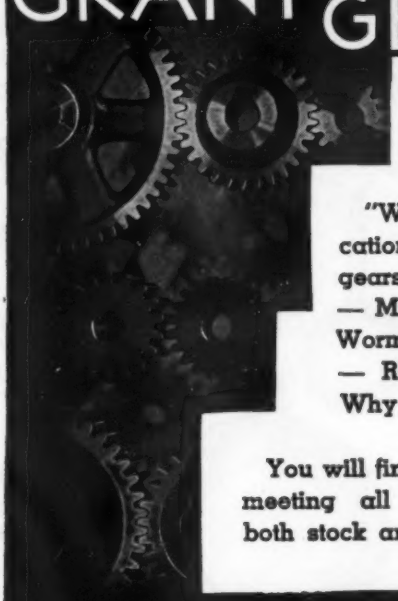
GRANT GEARS



"When your specifications call for special gears — Spur — Bevel — Mitres — Helical — Worms and Worm Gears — Reduction Units — Why not try GRANT.

You will find GRANT service meeting all requirements of both stock and special gears."

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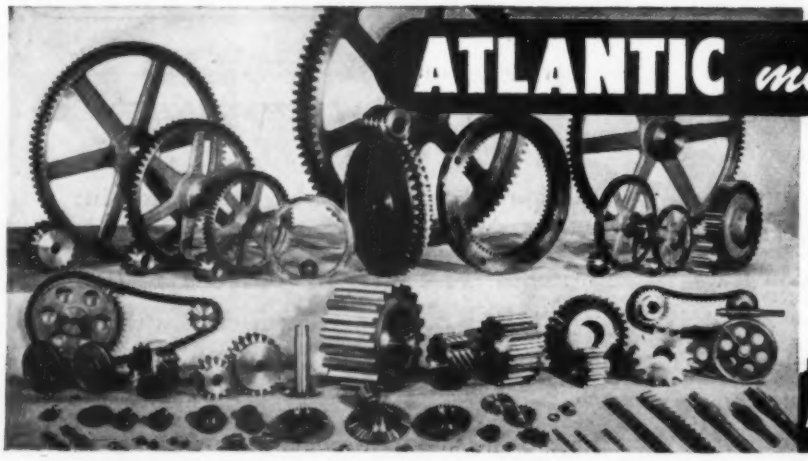
BOSTON, MASS.
ESTABLISHED 1864 BY SECO & GRANT



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ANY SIZE—¼" to 60"
ANY MATERIAL—Cast iron, steel, brass, bronze, Micarta
ANY QUANTITY—One gear or volume production
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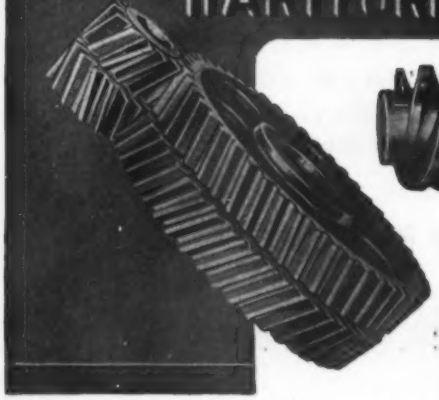
"HARTFORD" for Gears, Cams, Thread-Grinding



OUR SERVICE INCLUDES:

. . . cutting gears of every description exactly to specifications
. . . grinding gears, cams and threads
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You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.

THE HARTFORD SPECIAL MACHINERY CO.
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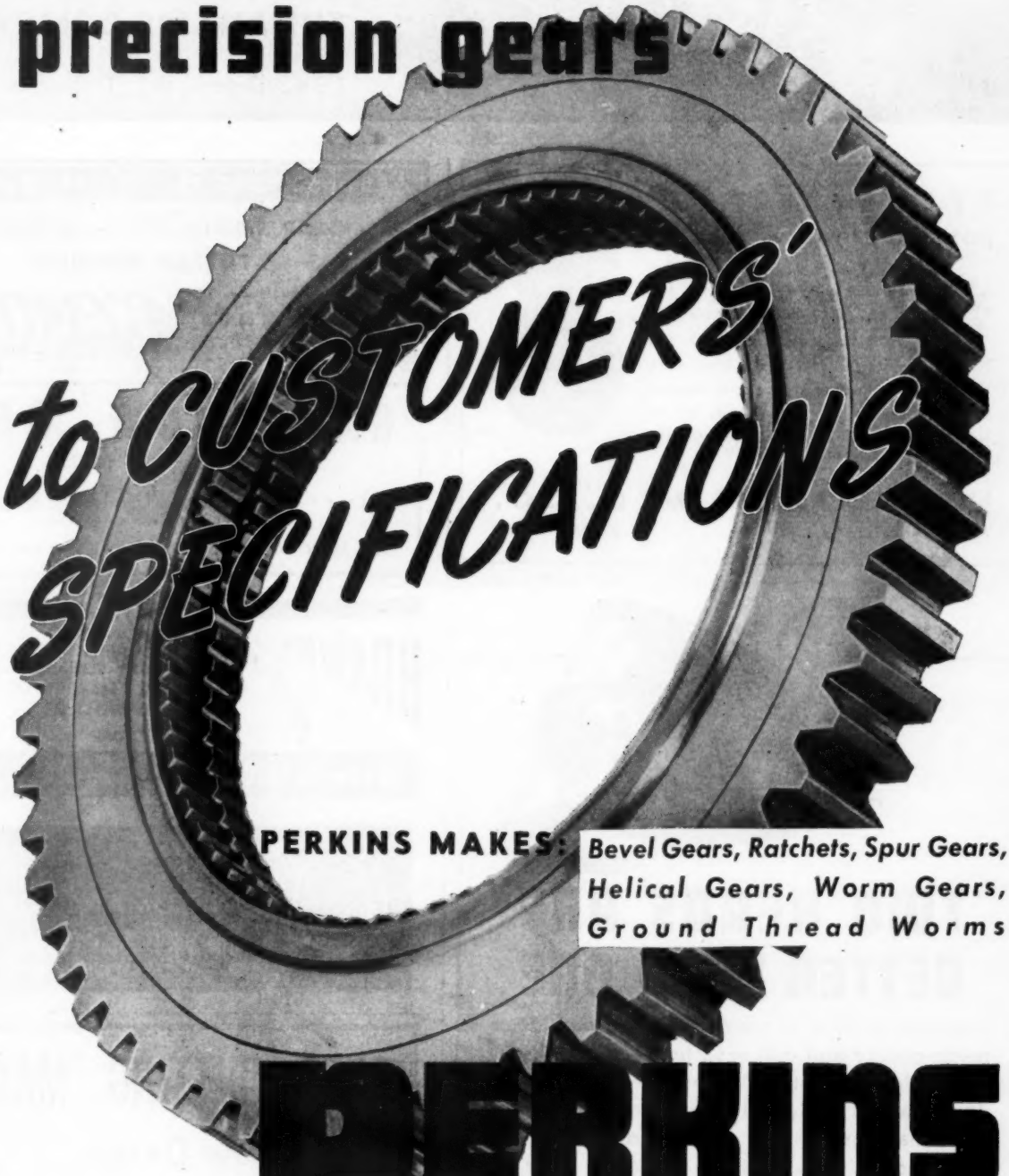
ONE PURPOSE ONLY...

The mass-production of precision gears



PERKINS MAKES: *Bevel Gears, Ratchets, Spur Gears, Helical Gears, Worm Gears, Ground Thread Worms*

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custom-cut **GEARS**

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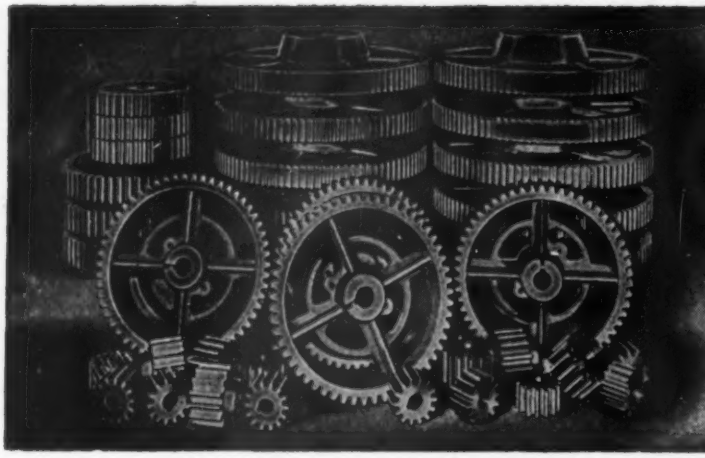

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BEVEL — MITER — RACKS

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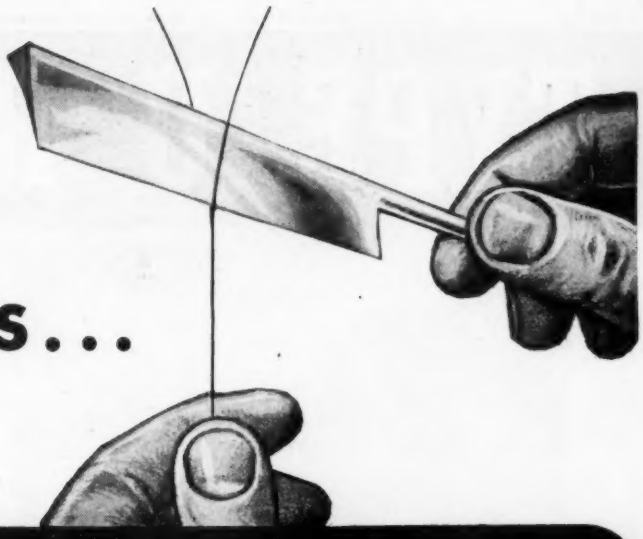
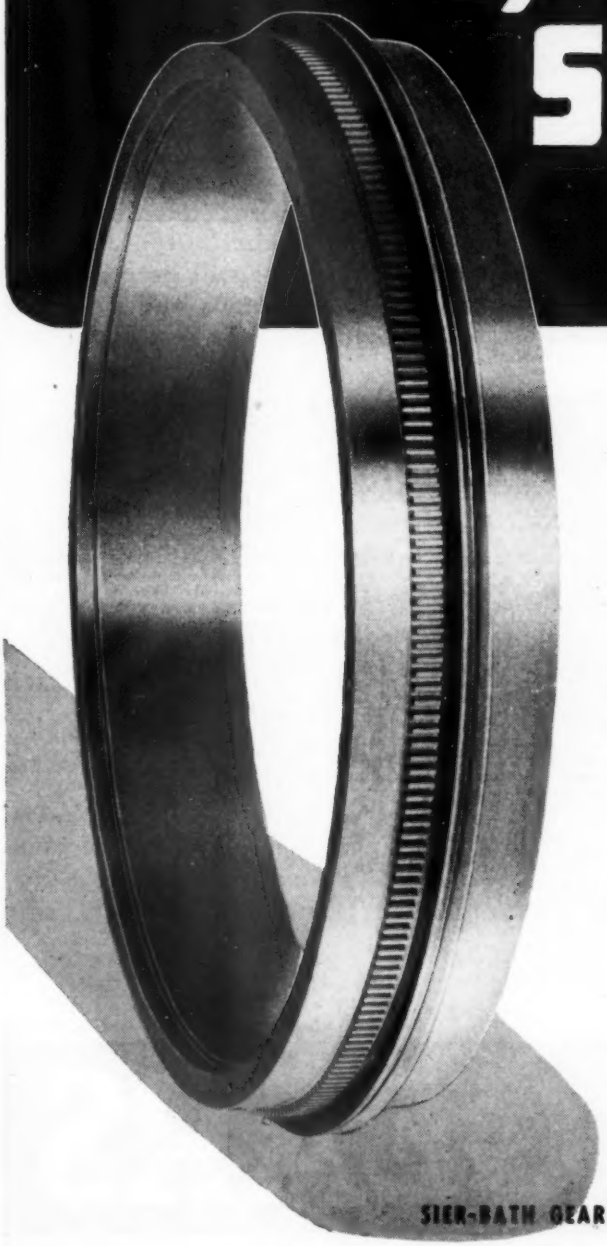


Specify SIER-BATH GEARS



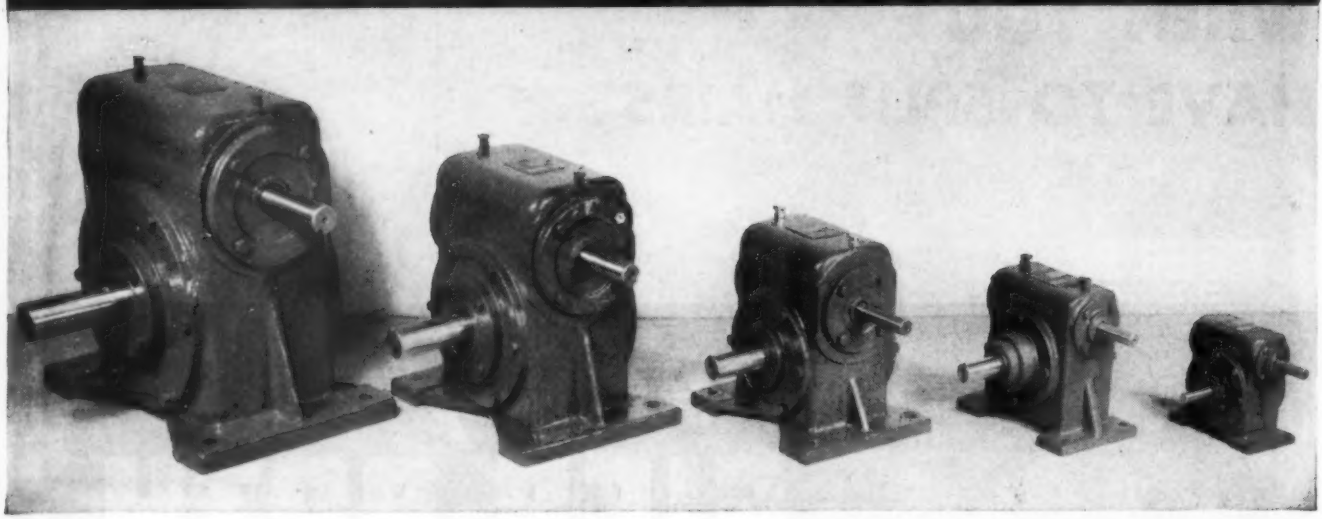
Here's how Sier-Bath accuracy held up when more than sales were at stake. For a highly secret application, the Vee groove and teeth of the spur gear shown had to be held within .0005" relationship. Though the material was tough austenitic stainless steel, accuracy was maintained through long runs and the delivery date met with margin to spare. Sier-Bath can do a similar job for you because it has the machines, the furnaces and the working conditions that hold the kind of men who hold to the highest standards. Write us, today.

☆ 1945 MARKS OUR 40TH YEAR OF SERVICE ☆

Sier-Bath Gear Co. Inc.

SIER-BATH GEAR COMPANY, Inc., 9246 HUDSON BLVD., NORTH BERGEN, N. J.

TYPE U REDUCTORS*



Boston Gear Standard Type "U" Reductors (speed reducers) are just one of fifteen types designed and built to provide you with economical and efficient means of speed reduction. They are available in ratios of 3¾ to 1 to 100 to 1 and are rated to carry output loads varying from 1/20 to 2¾ horsepower. All type "U" Reductors are equipped with phosphor bronze worm gears, hardened and ground steel worms and all shafts are mounted on Timken Tapered Roller Bearings.

Any of the following authorized distributors and direct company branches will be pleased to give you complete specifications and prices of these Boston Gear Standard Type "U" Reductors.

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Manufacturers Rubber & Supply Company
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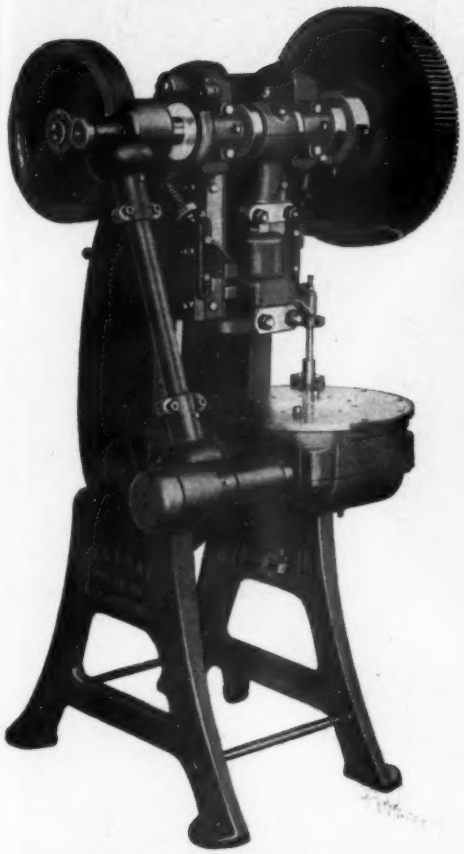
BOSTON GEARS



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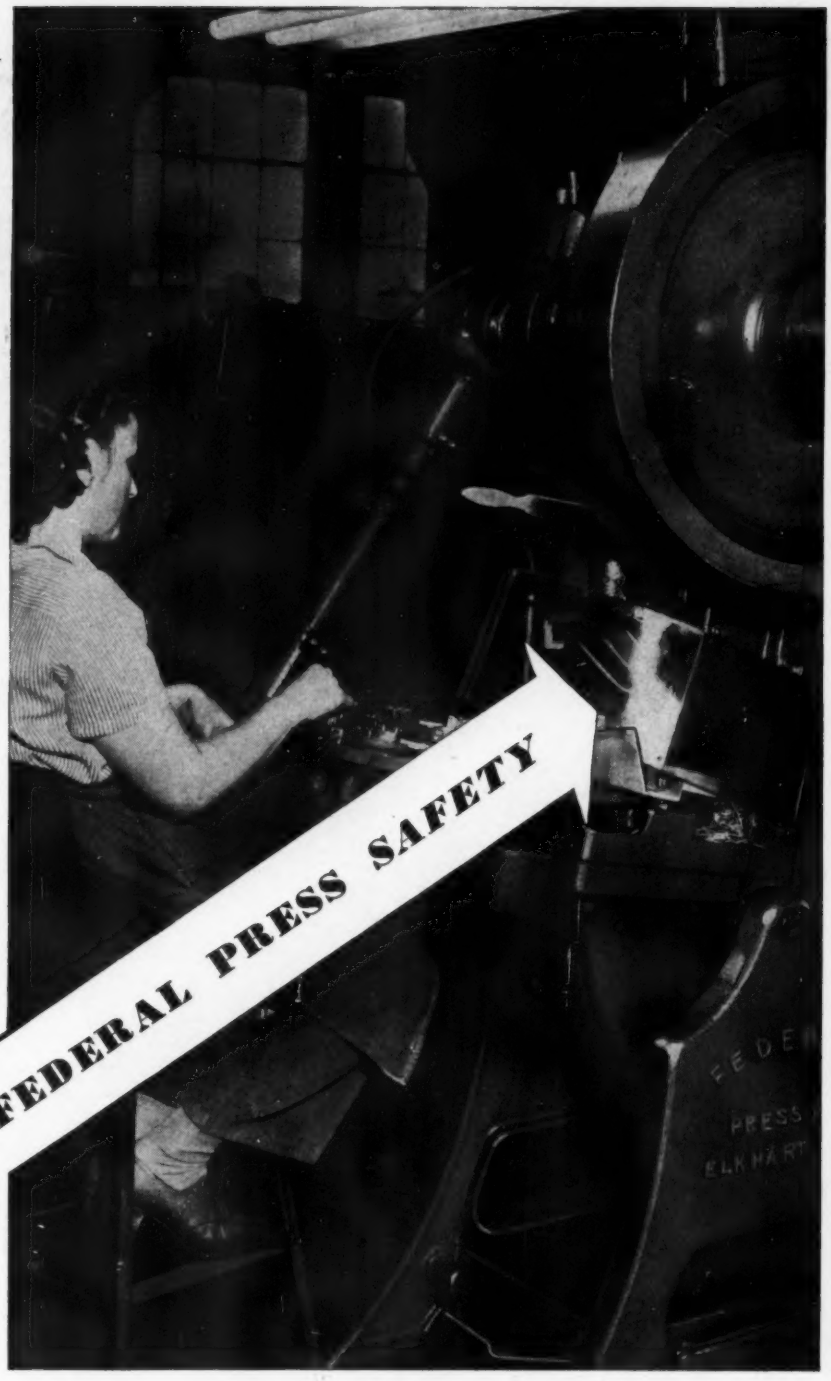


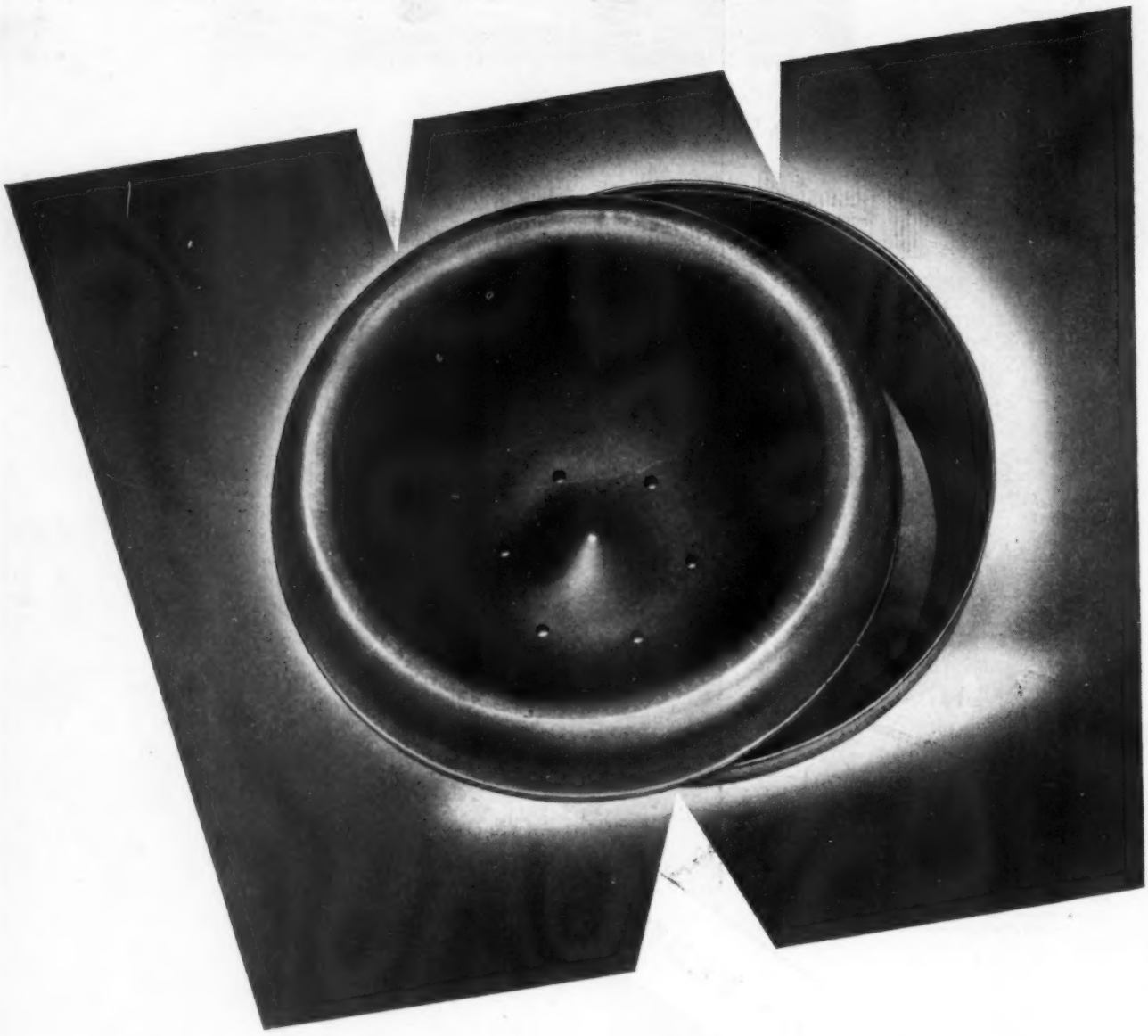
No danger—even with "green" women operators

With so many "green" women operators on the job, production safety is more difficult to control than ever before. Another reason why Federal Dial Feed Presses are so widely used today. Illustration shows one of three in operation constantly at the American Cabinet Hardware Corp. plant. Note operator's position—very convenient for rapid feeding, yet far away from the danger zone.

Yes, Federal Dial Feeds are safe—fast, smooth and precise, too. All moving parts, except the dial plate itself, are fully enclosed—assuring complete safety for the operator, eliminating any confusion, and often increasing production speed as much as 3 to 6 times. A positive locking mechanism smooths out the dial action, permitting unusually high speeds with exceptional accuracy, and assuring additional safety for the operator. Write for latest catalog on the complete line.

THE FEDERAL PRESS CO. *1109 Division St., Elkhart, Ind. Telephone 2831*

FEDERAL
DIAL FEED
PRESSES



Someone Said, "That's a Stamping Job for Presteel"

The two pieces in this loud speaker assembly—about 12 in. dia.—had to be stamped for a press fit. Parabolic contours also had to be exactly right to throw the sound correctly. This sort of job is not done in a few operations (note peak in bottom of casing), but the costs were still well within the desired limits. Presteel has established a reputation for producing stampings to close tolerances. Whenever you have a production problem that might be handled on presses, take advantage of the advice and assistance offered by the Presteel engineering staff.

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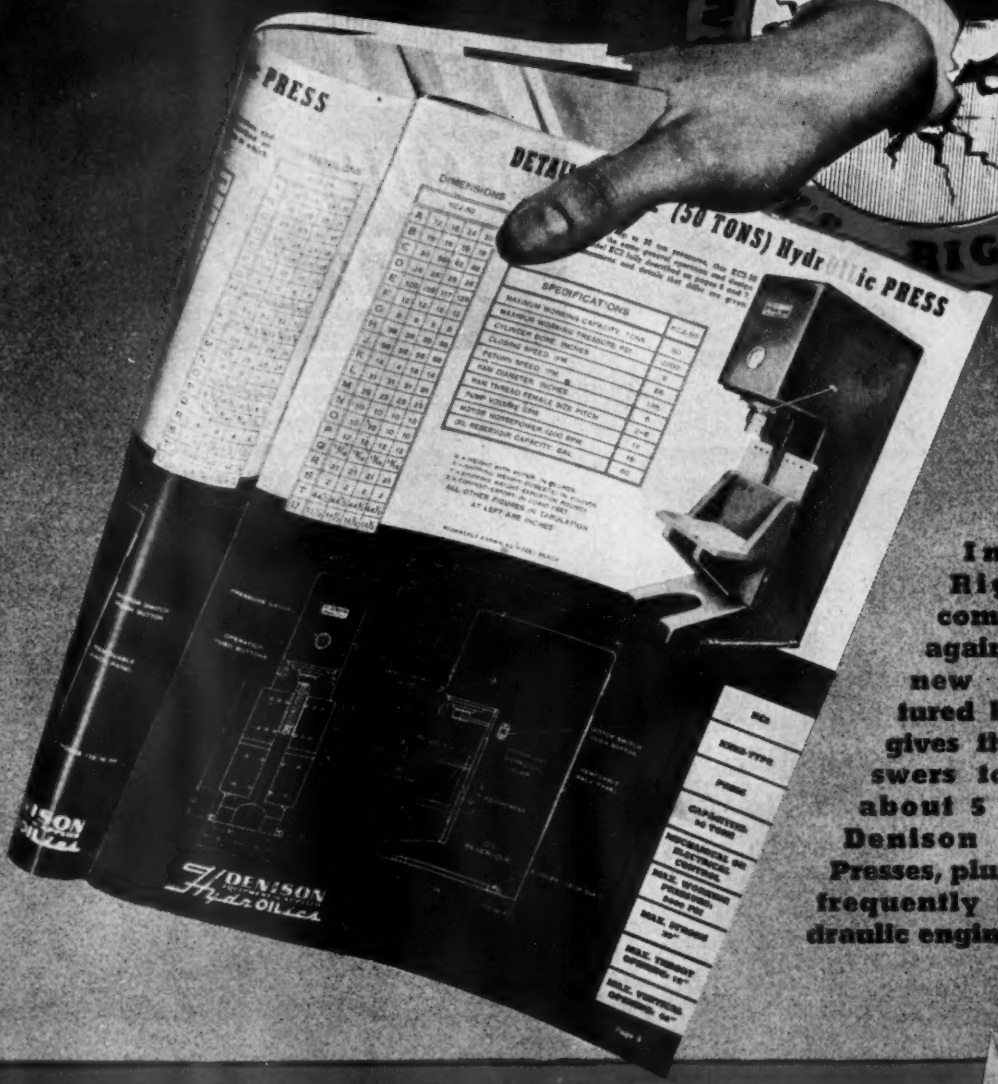
You'll Find This Book Valuable in 2 Ways!



Industry's Right Hand comes through again — with a new double-featured bulletin that gives the right answers to questions about 5 to 200-ton Denison HydrOILic Presses, plus useful and frequently needed hydraulic engineering data.

Yours For The Asking

This new bulletin is packed with the kind of *complete* hydraulic press data you want. Note in the typical page above how the conveniently tabled specifications and detailed drawings give you facts *quickly*—without fuss or frills—on Denison's complete line of standard HydrOILic presses in the 5- to 200-ton range. And in addition, you'll find the tables on pages 19 to 29 a most helpful collection of hydraulic engineering data. Write for your copy of this new bulletin today . . . on your company's stationery, please. The Denison Engineering Co., 1164 Dublin Road, Columbus 16, Ohio.

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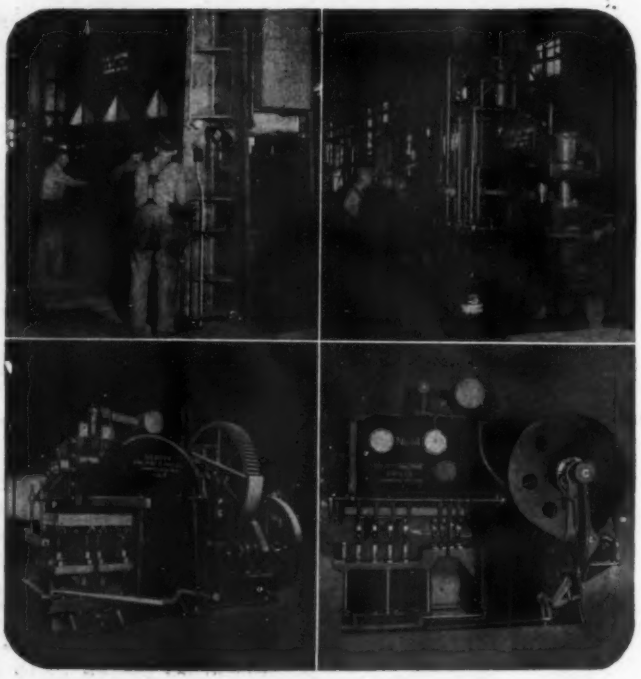

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HYDRAULIC FEED SURFACE
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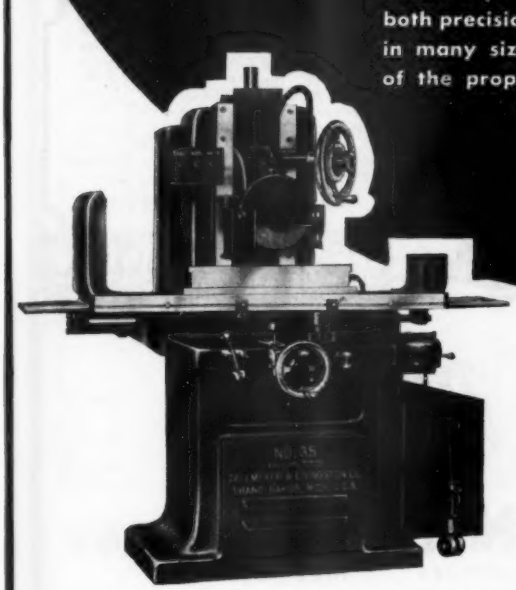
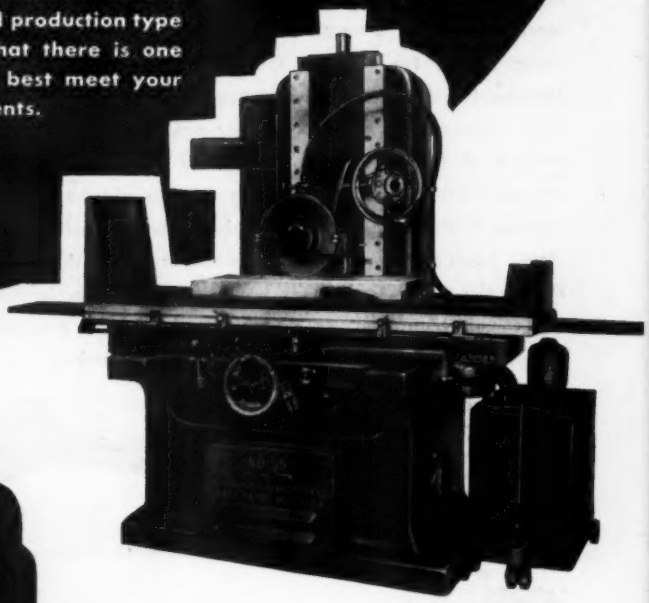
GALLMEYER & LIVINGSTON COMPANY is today building what is without question the finest, smoothest, and fastest Hydraulic Feed Surface Grinders of their entire career — a direct result of over 35 years of experience in the design and production of high grade precision grinding machinery. These machines are manufactured in both precision tool room type and production type in many sizes with the result that there is one of the proper size and type to best meet your particular requirements.



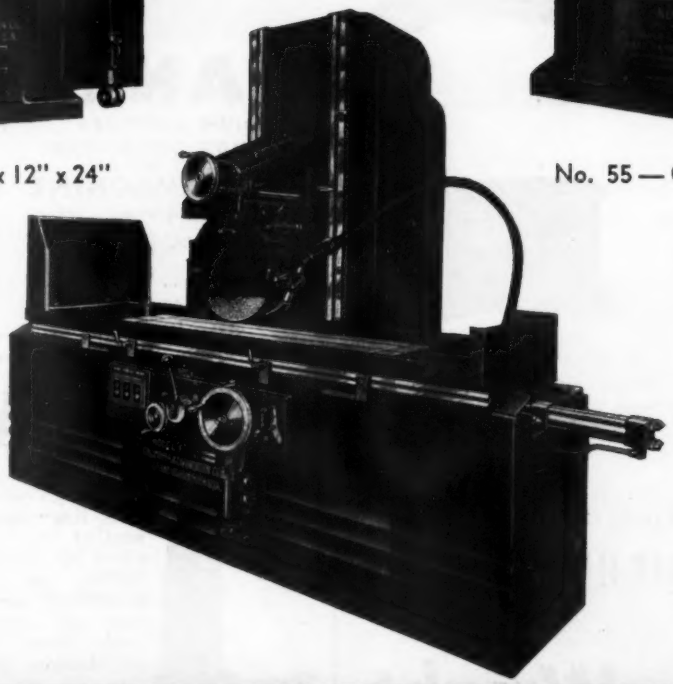
No. 35 — Capacity 8" x 12" x 24"



No. 55 — Capacity 12" x 17" x 36"

Precision Tool Room Type Machines

This is the type of GRAND RAPIDS Hydraulic Feed Surface Grinder on which one prominent machine tool builder obtains a 5 micro inch finish operating machine at 125 feet per minute. They are illustrated and described in bulletin GL-100.



Production Machines

GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders manufactured by the GALLMEYER & LIVINGSTON COMPANY are designated as Model F and Model A and feature the use of wide faced wheel and cross traveling head. GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders are illustrated and described in bulletin GL-4-1-43. Write for your copy today.

GALLMEYER & LIVINGSTON CO.

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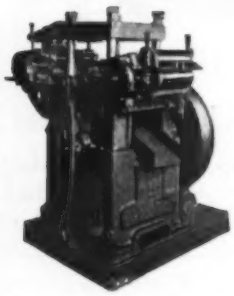
Post-war Stamping Standards will be on a COMPLETE-PER-STROKE Basis!

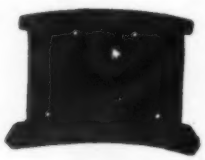
One machine and one operator turning out as many stampings as 5 to 10 machines and operators formerly—that is rapidly becoming the "normal" basis for figuring the purchasing and production of stamped parts. By using Henry & Wright Dieing Machines, you get complete-per-stroke production of intricate stamped parts. Far more than this, the versatility of the Dieing Machine (which is completely individual and unique in design) permits the making of parts formerly produced only by other methods at far higher cost. In short, it has introduced not only new cost standards of stamping, but has added new possibilities to the process. With precision of product held within .0002" limits when required, these machines extend the useful life of dies 600% to 1200%. Investigate their potentialities. Our engineers are equipped to discuss your stamping problems in full detail, including devising methods for new articles.

Can opener blade, requiring operations including sunken lettering and beveled blade, produced complete per stroke on Dieing Machine at greatly increased rate.

Motor base produced complete one per stroke from 16 gauge steel. Dimensions 6¾"x5"x1¾".



50-TON DIEING MACHINE
Other capacities: 10 tons to 300 tons.



Pole piece for Diesel engine commutator assembly produced complete one per stroke, 120 per minute.

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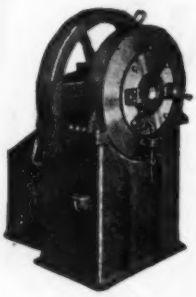
Henry & Wright Dieing Machines



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— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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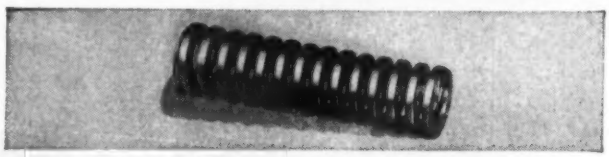

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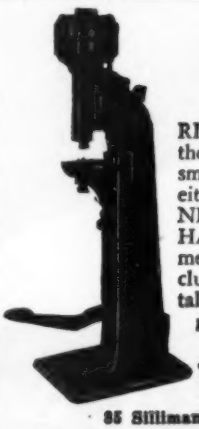

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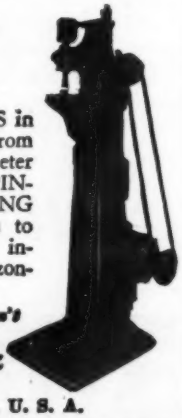
RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Stillman Ave., Bridgeport, Conn., U. S. A.

FORM AND MULTIPLE THREAD CUTTERS, H.S.S. OR CARBIDE

Plan-Co Form and Thread Milling Cutters are the product of years of on-the-job milling experience. Made by the makers of Plan-O-Mill Form and Thread Milling Machines, they incorporate improvements developed and pioneered by Plan-O-Mill engineers.

Plan-Co Form and Thread Milling Cutters offer you: (1) Exacting accuracy and exceptional finish. (2) Increased output and longer tool life, due to greater wear resistance.

Every Plan-Co cutter is subjected to rigid inspection with modern equipment before being approved for delivery to you.

FIRSTS by PLAN-O-MILL

1. First to install General Electric's remarkable new Thy-mo-trol electric feed control!
2. First planetary to mill external threads with standard multiple thread cutter!
3. First planetary to coordinate feeds and speeds!
4. First to provide absolute control of feed-in!
5. First to offer a practical, low cost carbide thread milling cutter!

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HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

THREAD AND FORM PLAN-CO MILLING CUTTERS

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
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Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
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For bar stock up to 2" in diameter
12" turning length
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Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
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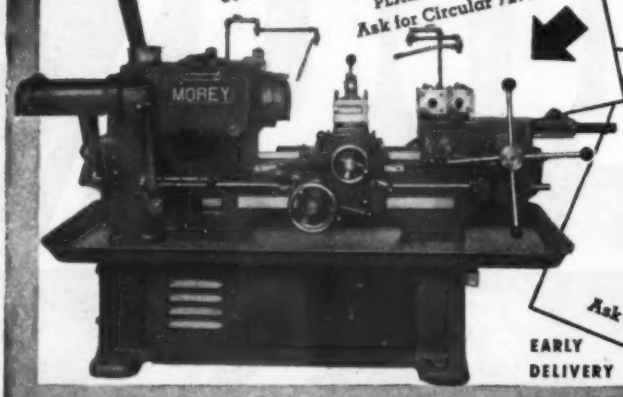

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- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
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THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

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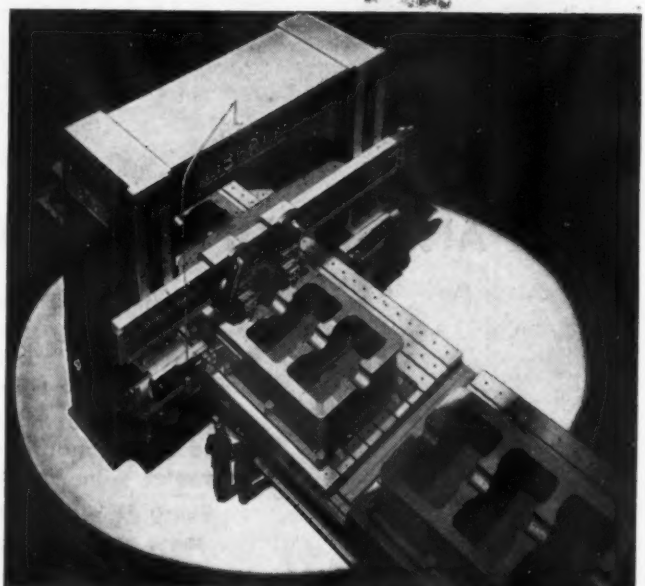

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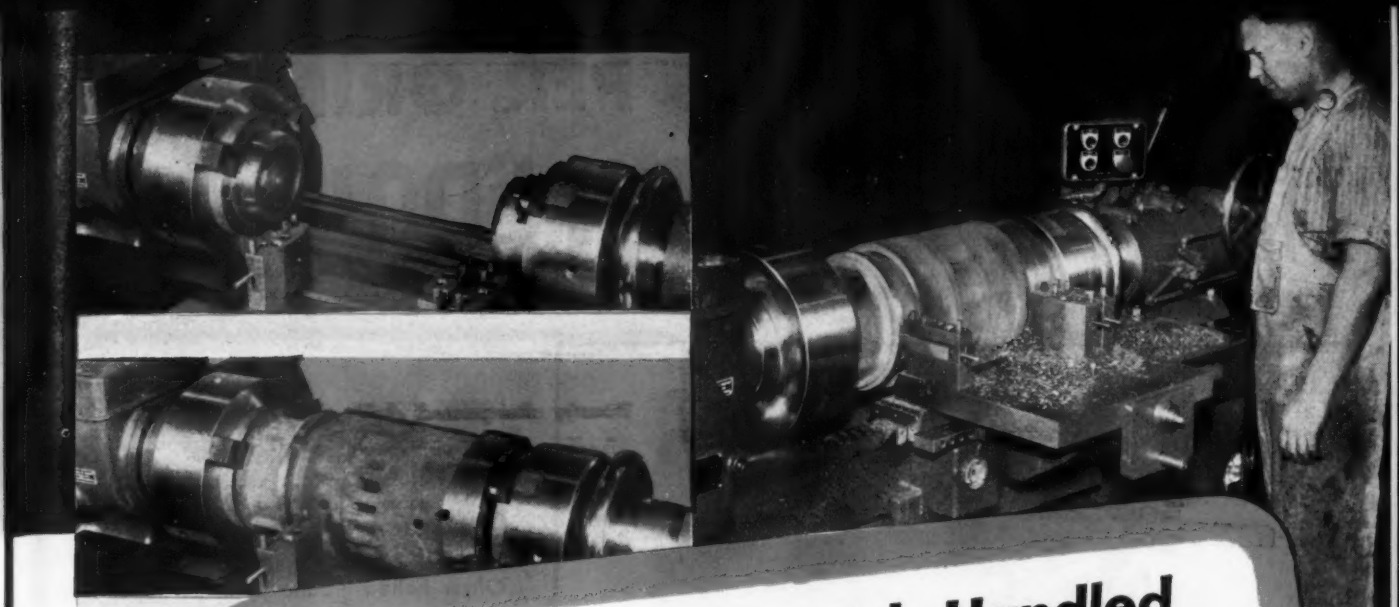
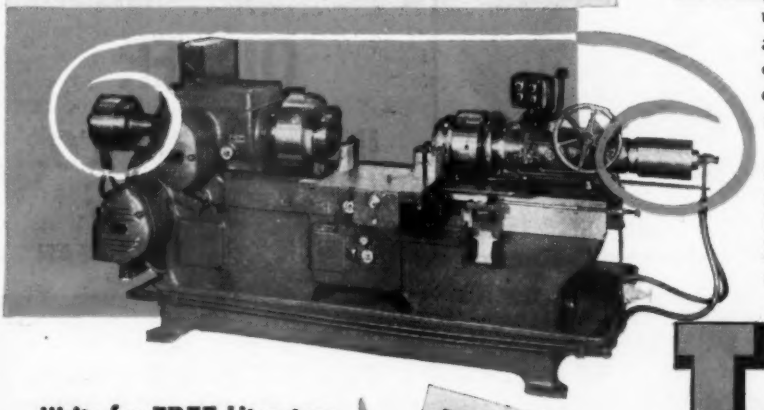
SMALL, MEDIUM AND HEAVY DUTY
PLANERS
FOR HIGH SPEED, LOW COST PRODUCTION
LIBERTY PLANERS • HAMILTON, OHIO, U. S. A.
Over a Quarter Century of Specialized Experience with Time Tested Principles of Design



Difficult Chucking Job Handled Quickly and Accurately with DUAL "LOGAN" CHUCKS

Diesel Engine Cylinder Liner Held in Air-Operated Chucks for Heavy Cuts on Sundstrand Automatic Lathe

Fast, precision chucking of this large cast-iron cylinder liner is obtained with dual Logan air-operated chucks, controlled manually from a single valve. A centering plug is mounted on the face of the 3-jaw *driving chuck* for aligning the workpiece. The duplex type *tailstock chuck* has two pairs of jaws operated independently to facilitate loading. The entire tailstock chuck assembly is mounted on a quill which can be quickly advanced or retracted.



Your applications requiring fast, accurate, positive chucking can be handled with similar effectiveness on standard Logan air or hydraulic-operated chucks. Chucking time is often cut to *seconds*. Important savings in operator fatigue and idle machine time can be obtained. High accuracy and finish are maintained . . . rejects and spoilage are minimized.

Investigate the advantages to be obtained with Logan air and hydraulic-operated chucks — available in a wide range of standard sizes and types for every kind of application.

Logan Rotating Air Cylinders Provide Required Chuck Action

To provide the action necessary for accurately positioning and clamping the workpiece, Logan rotating air cylinders are used to actuate both chucks on this job. A 10" diameter, double-acting cylinder with special 2" stroke operates the driving chuck. A 6" x 6" tandem-type cylinder provides independent control of the two sets of jaws on the tailstock chuck.

Logan rotating air cylinders are designed especially for mounting on machine tool spindles. Standard sizes will fit most applications; cylinders of special bore and stroke can be furnished to specifications. Logan chucks, cylinders, valves and air accessories work together as a balanced chucking system.

Write for FREE Literature

Write for new catalogs covering Logan air and hydraulic-operated chucks; air and hydraulic cylinders, valves and accessories; and hydraulic power units. Ask for engineering recommendations on installation of air or hydraulic-operated systems of all types. Layouts furnished, no obligation.

ARMY E NAVY

Logan SAVES ★TIME ★EFFORT ★MOTION

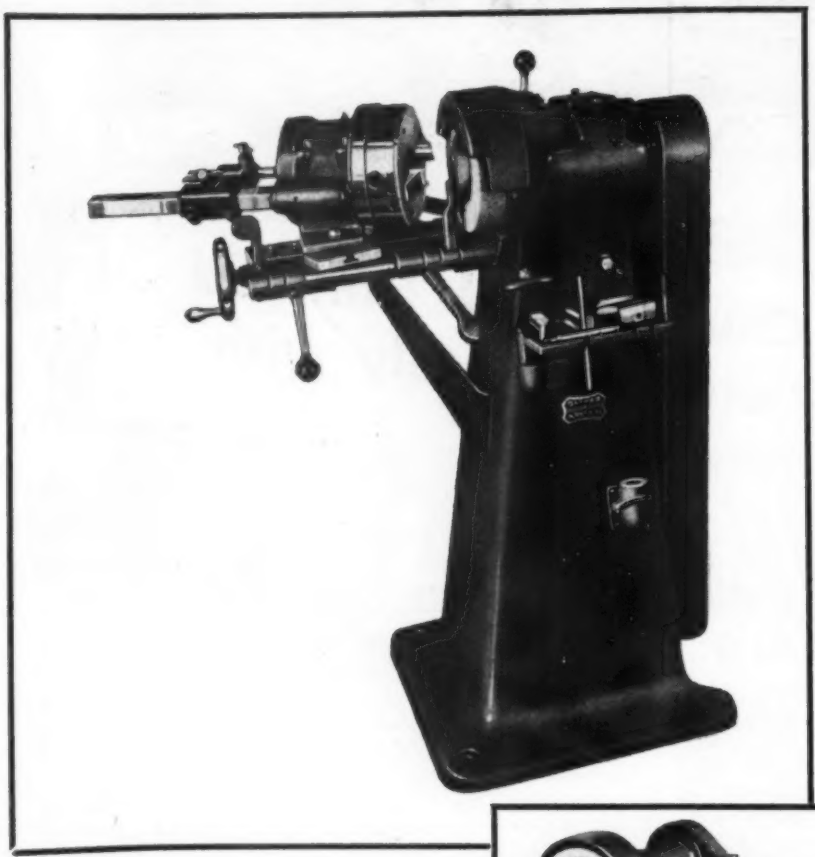
Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC. 918 CENTER AVE LOGANSPORT INDIANA

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE-FLOW COOLANT PUMPS

FOR MORE HOLES PER GRIND....

THE OLIVER DRILLPOINTER



Poorly sharpened drills dull quickly, drill slowly, are inefficient, and impose undue strains on both drill and drilling equipment. Drills sharpened on the OLIVER DRILLPOINTER . . . with the patented Oliver hollow-ground point . . . speed up operations, reduce load on machines, require less frequent grinding. Completely automatic cam-controlled action of the Drillpointer enables even unskilled operators to grind points that are mathematically accurate in every dimension.

The Oliver No. 510 Drillpointer (left) is quickly set up for all drills from 1/4" to 3" dia., for any point angle from 82° to 160° and variable clearance, enabling you to select the point that is exactly right for the material being drilled. See Bench Drill Grinder below. *Write for bulletin.*

• LEFT: Oliver No. 21 Bench Drill Grinder, hand operated, for drills from No. 57 to 1/2". Attachments available for grinding oil hole drills, left-hand drills and other special points.

Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER

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AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

Production *Increased*
FROM 2 to 6 PIECES PER HOUR

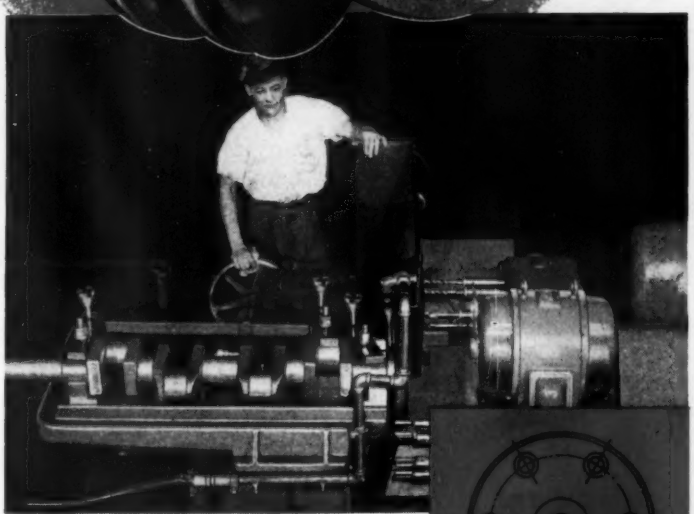
View of flange of Diesel Engine Crankshaft showing location of six holes, drilled, countersunk, reamed and tapped.

Drilling, Countersinking, Reaming and Tapping Operations Combined in One Barnes No. 412 Single End Machine

Six holes in the flange of a diesel engine crankshaft are accurately drilled, countersunk, reamed and tapped with the W. F. and John Barnes No. 412 Single End, Progressive Step-Through Machine in 10 minutes. With conventional radial drills, machining one hole at a time, the best production possible was one piece every 30 minutes. From 2 crankshafts machined per hour, the Barnes machine increased production to 6 pieces per hour. Accuracy in the tapped dimension — .002" tolerance between holes for aligning with flywheel — was consistently maintained.

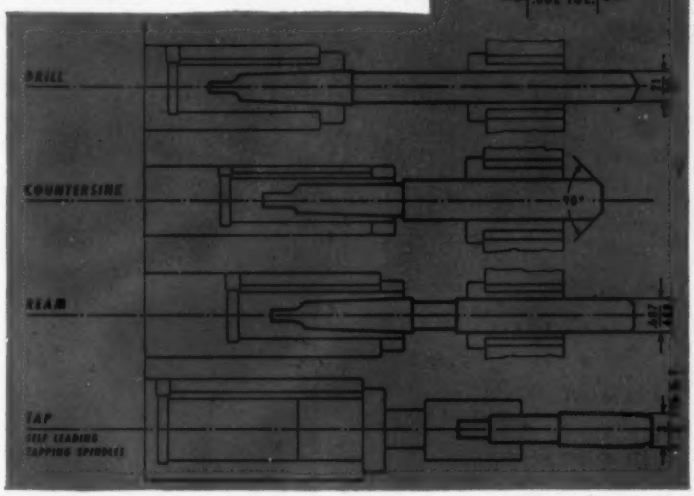
Best suited for such operations as drilling, reaming, boring, counterboring, milling, hollow milling, chamfering or facing, Barnes machines are designed to combine any or all of these machining operations. In addition, Barnes standard hydraulic units can be rapidly converted to perform jobs other than those for which they were originally intended.

Barnes engineers can determine quickly whether or not you are using the right machine for jobs similar to this. A careful analysis of your work requirements — what has to be done, accuracy required, and rate of production desired — will bring you detailed information on how Barnes Unit-Type and Special Machines increase production at lower costs. There is no obligation for this Barnes survey.



Operator at controls of W. F. and John Barnes No. 412 Single End Machine. All operations — drilling, countersinking, reaming, and tapping — are controlled by pushbutton.

Schematic diagram shows tooling used in machining operations of 6 holes in flange of crankshaft.



TOOLING AND OPERATIONS

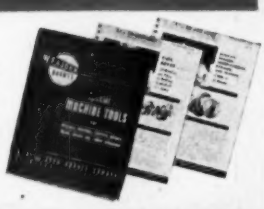
NUMBER OF SPINDLES — 24.

OPERATIONS PERFORMED:

a. Barnes SH-12 Hydraulic Sliding Head Unit — 18 spindles.
Cycle — rapid approach, feed, dwell and rapid return
1. Drill 6 holes — 21/32".
2. Countersink 6 holes — 1/16" x 90°.
3. Ream 6 holes — .687-.688".

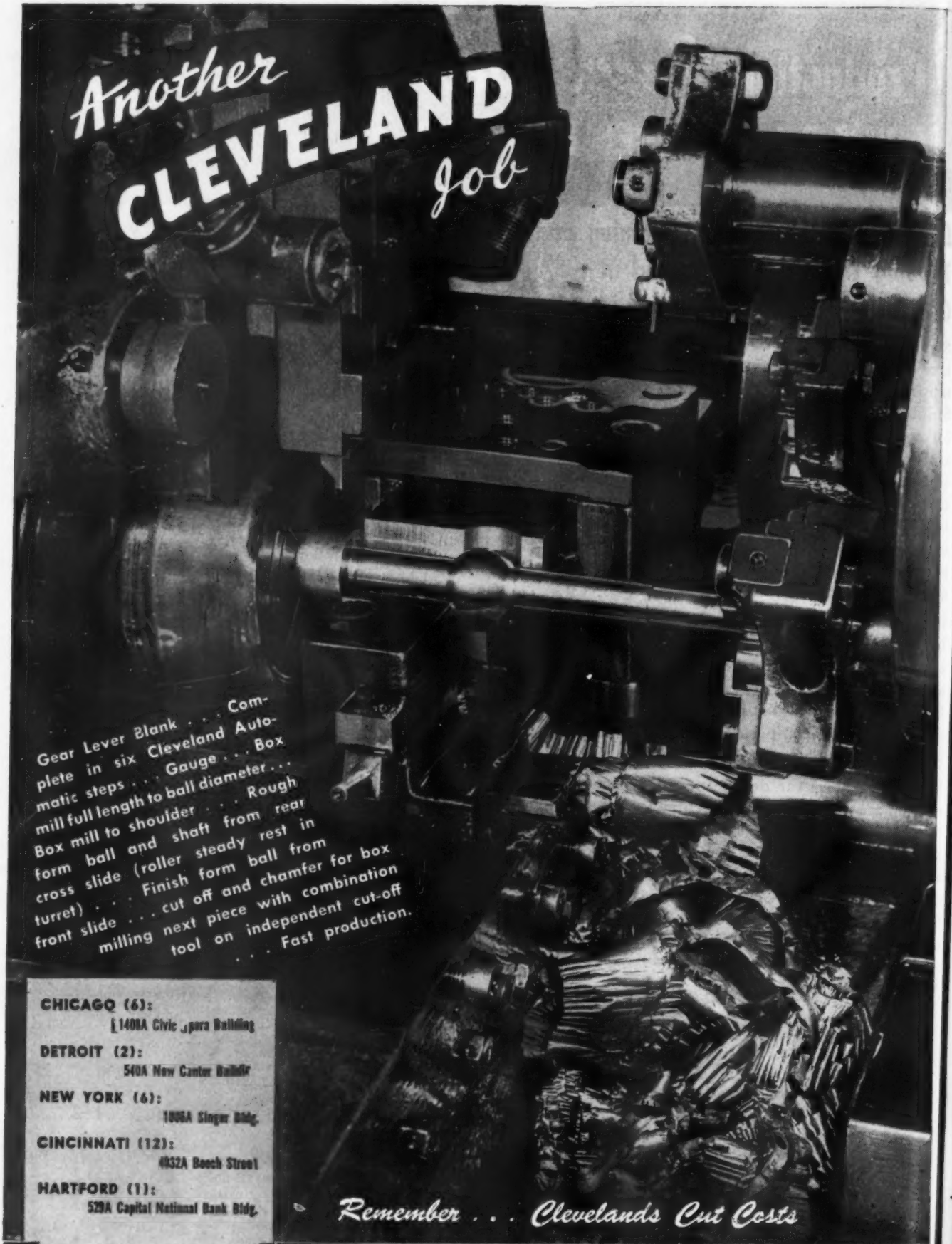
b. Tap Head Unit — 6 spindles.
Cycle — tap forward, tap return.
4. Tap 6 holes, 3/4" — 16 N.F. thread.

Ask for the NEW "SPECIAL MACHINE TOOLS" Book (No. 945) which contains specific "Performance Data" stories taken from the field, together with other valuable production and tooling ideas. This book will be sent key executives in metal working plants without cost.



W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.


Another
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Job
Gear Lever Blank . . . Complete in six Cleveland Automatic steps . . . Gauge . . . Box mill full length to ball diameter . . . Box mill to shoulder . . . Rough form ball and shaft from rear cross slide (roller steady rest in turret) . . . Finish form ball from front slide . . . cut off and chamfer for box milling next piece with combination tool on independent cut-off . . . Fast production.
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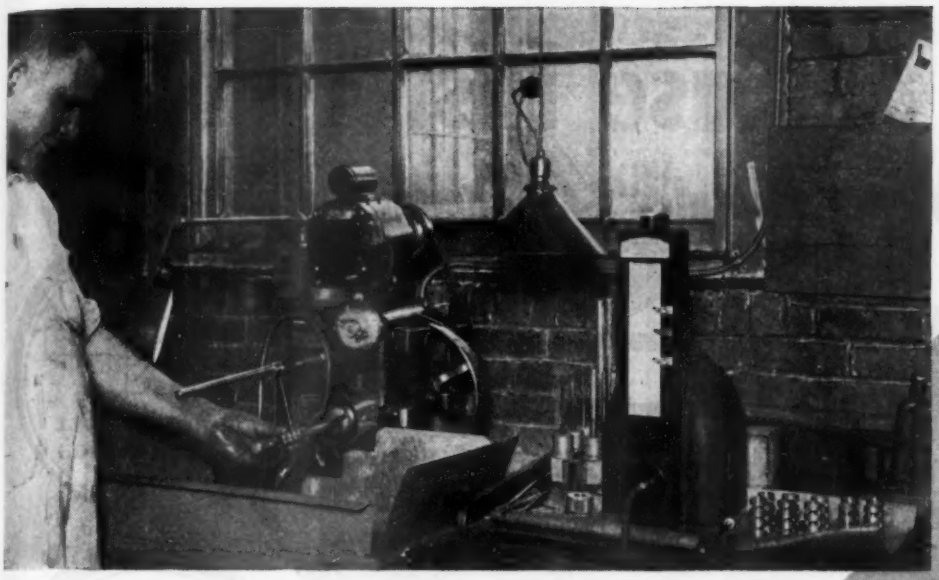
Remember . . . Clevelands Cut Costs
THE CLEVELAND AUTOMATIC MACHINE CO.



Pickering Governors, such as the one shown here, control the speed of prime movers within 1/100 of 1 per cent, thus accuracy is an absolute essential.

Tolerance .00007"

with Sunnen Precision Honing

Plus Selective Fitting!

The Pickering Governor Company had an internal finishing job that couldn't be handled economically by conventional internal finishing methods. The hole diameter was too small in proportion to its length to allow accurate finishes — until they started using the "MA" Precision Honing Machine.

These parts are machine reamed to .003" undersize; then sized and finished on the Sunnen Precision Honing Machine to a tolerance of .000125". When inspected, the parts are marked whether plus or minus, and the mating parts are similarly marked. The result is a final operating clearance on most parts within .00007" of the specified value. The maximum possible variation is .000125".

This experience is not an isolated instance. Hundreds of Sunnen Precision Honing Machines are doing similar jobs in war plants today and will be quickly and easily converted to peace-time production.

Let a Sunnen engineer come in to give you complete details on how this machine can be used on your jobs — or write for a free bulletin.

The SUNNEN Precision Honing Machine

- Hones and finishes internal cylindrical surfaces from .185" to 2.625"
- Accuracy guaranteed within .0001"
- Produces a super-smooth finith of 2 to 3 micro-inches
- Can be used in any metal or plastic except lead and babbitt
- No jigs or fixtures needed
- Does not require skilled labor
- Can be "set up" for any size in one minute
- Economical to operate

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Typical Jobs **SUNNEN**

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

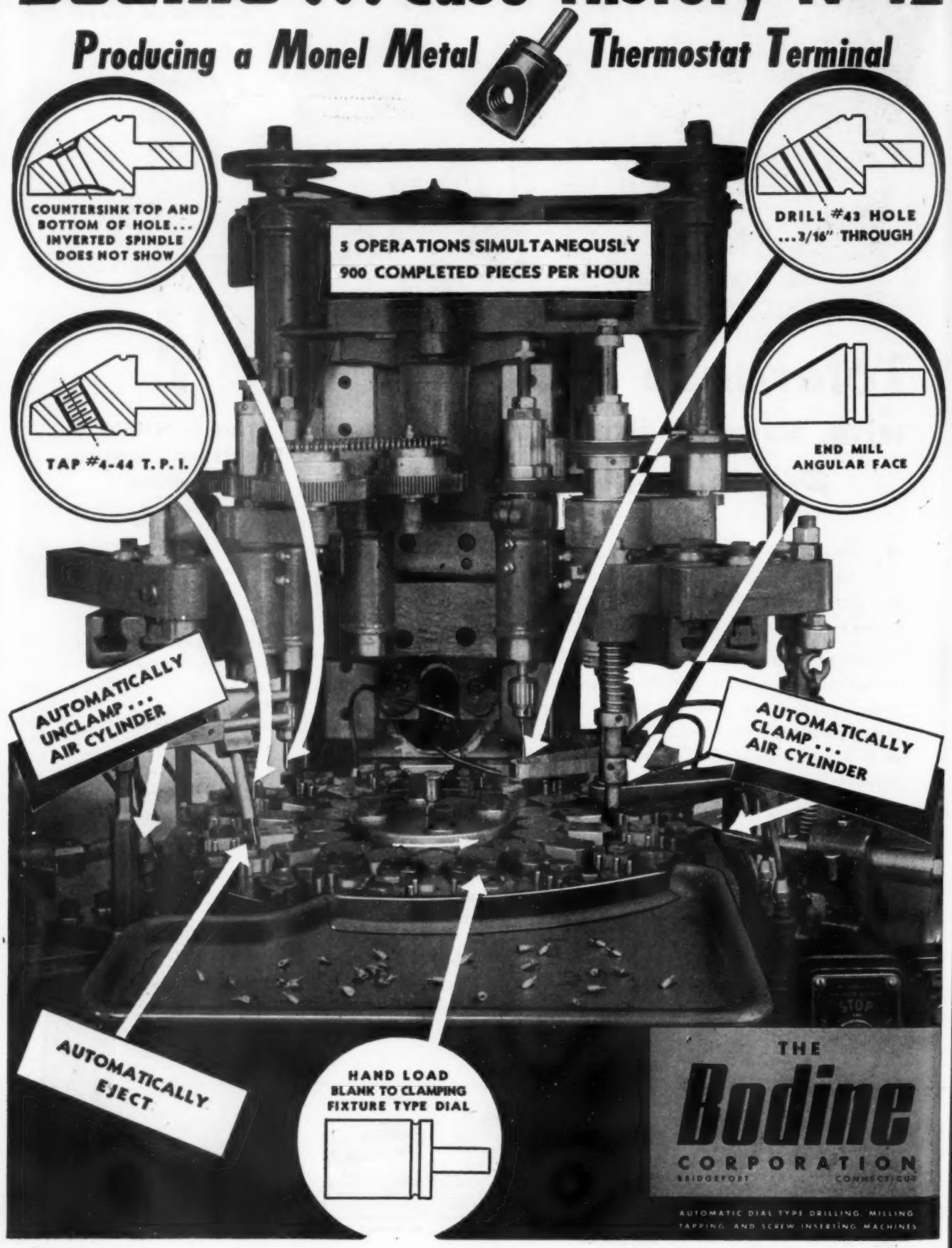
Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Bodine ... Case History No. 12

Producing a Monel Metal Thermostat Terminal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5 OPERATIONS SIMULTANEOUSLY
900 COMPLETED PIECES PER HOUR
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END MILL ANGULAR FACE
AUTOMATICALLY UNCLAMP... AIR CYLINDER
AUTOMATICALLY CLAMP... AIR CYLINDER
AUTOMATICALLY EJECT
HAND LOAD BLANK TO CLAMPING FIXTURE TYPE DIAL
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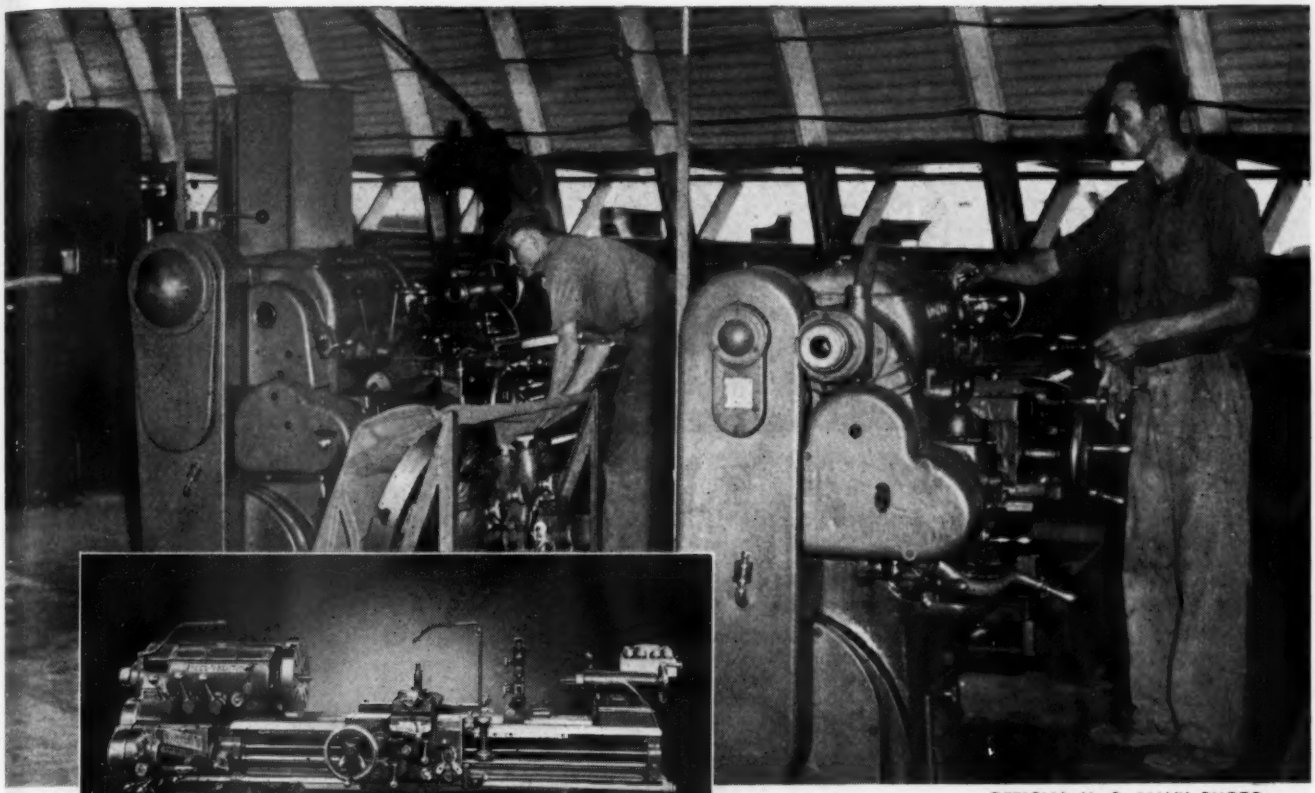

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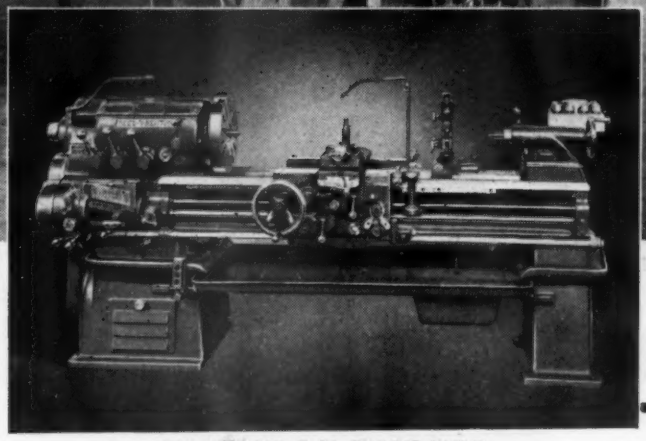
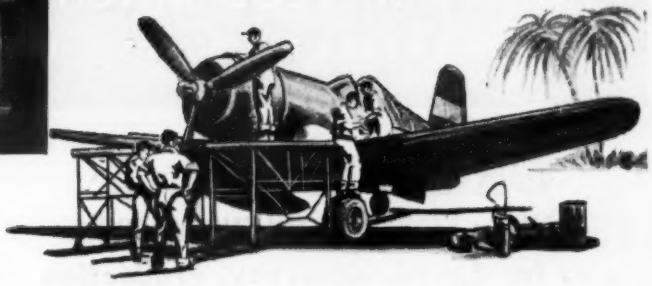


16" REED-PRENTICE ENGINE LATHE



REED-PRENTICE LATHES . . . . *at Pacific Bases*

Repair and maintenance is a serious problem when valuable equipment is damaged far from home!

A large share of this fine-tolerance machining is done at advance base construction depots — many of them equipped with 14 and 20 inch Reed-Prentice lathes (as pictured above).

On land and at sea—Reed-Prentice engine and toolroom lathes are doing a dependable job — the kind of essential work to be expected from machines made by experienced builders.

Models include 14 and 16 inch Toolroom; 14, 16 and 20 inch Engine Lathes. Write for full information and descriptive literature.

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FASTER CUTS

CLEANER CUTS

STRAIGHTER CUTS

Save Time

Save Costs

assured by the

PORTER-McLEOD COLD METAL SAWING MACHINE

Valuable time on war work can be saved by the 8" Porter-McLeod high production machine on all classes of work.

Its rating as a truly high production machine is the result of design features which make it possible to nest bars or shapes for multiple cutting, a method of holding the work securely during fast feeds, a unique upward blade movement through stock and a saw design which provides cutting action by every tooth.

These features result in remarkably fast, clean, straight cuts. Sturdy construction and ample power contribute to its ability to handle a standard feed of 3" per minute. Capacity: 8" round or 7½" square stock.

Explore the possibilities of the 8" Porter-McLeod Machine on your high production cold metal sawing operations. *Write today for Descriptive Bulletin.*

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HATFIELD, MASS., U. S. A.

GREAVES No. 2

PLAIN or UNIVERSAL MILLING MACHINE

. . . for Speed, Accuracy, Production and Tool Room Work . . .

featuring:

- Power Feeds, all Directions
- Rapid Traverse—6-way
- Alloy Hardened Gears
- One Shot Lubrication to Table, Saddle Slides and Screws
- All Speed and Feed Changes through Positive Gearing
- All Speed and Feed Gearing run in Oil
- Timken Bearings
- Glass Sight Oil Control
- Unit Construction
- Central Control Position for all Operation Levers
- Coolant System

Specifications

Table—52¼" x 12"
Feed range—Longitudinal Power Feed 28"
Cross Power Feed 10"
Vertical Power Feed 19"
Overarm—4½" diameter
Spindle—Chrome nickel steel National Standard taper hole #50
Speeds—18—Range 20-1000 RPM Reverse on all speeds
Feeds—9—Range ½" to 18" per minute
Rapid traverse — Longitudinal — cross and vertical—All directions—75" per minute
Weight—3750 lbs.

Send for illustrated literature giving complete information.
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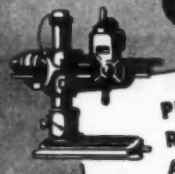
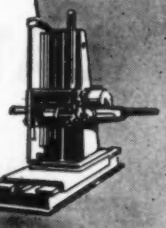


PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

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CINCINNATI, OHIO

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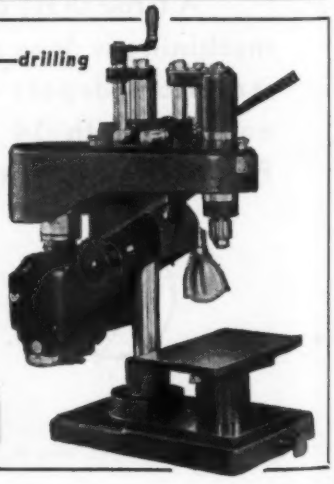
SUPER-SENSITIVE and "Super" in Every Way HAMILTON "MAXI-JR-E" DRILLING MACHINE

for small holes from .004" to .250" dia.

8-inch vertical adjustment on column. Drilling unit overhang from center of chuck to column, 5". Possible spindle speeds from 750 to 12,000 r.p.m.

Write for new bulletins.



THE HAMILTON TOOL CO.
HAMILTON, OHIO

AO's complete line covers the major items of personal protection

Goggles for all types of eye hazards

Each of AO's many goggles is designed to protect a worker on his particular type of job . . . to let him work in comfort and safety. In addition, AO offers helmets, hoods, and welding glass.

Clothing for all-around protection

AO has a complete line of safety clothing for welders, steel mill and foundry workers. Chrome leather jackets, coats, aprons, pants, overalls, sleevelets, leggings, spats, leather and asbestos gloves and mittens—all are designed for maximum freedom and protection.

Respirators for more than 139 hazards that endanger the lungs and respiratory system

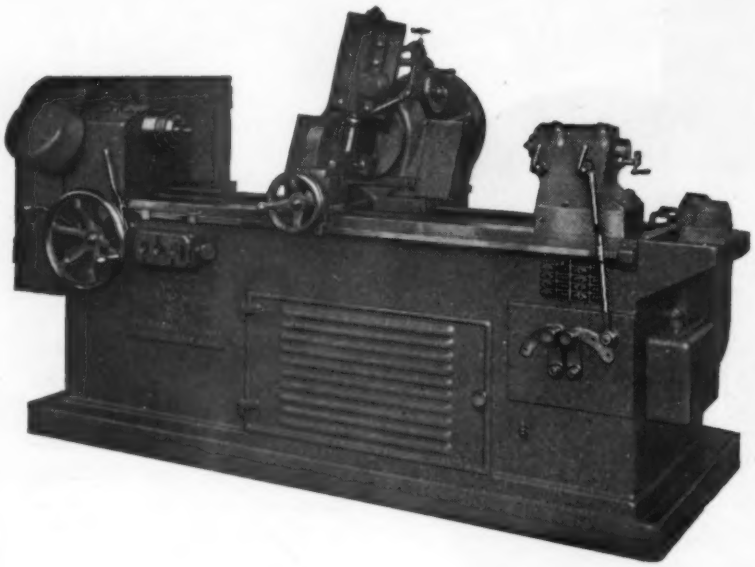
AO makes a full line of respirators to protect your workers against dusts, and low concentrations of gases and vapors. AO Respirators may be worn with safety and comfort for long periods.

To provide you with efficient service and speedy delivery, AO Branches are located in every principal industrial city. Your AO representative will show you how AO can set up a complete safety program that covers your major safety needs. Make arrangements for him to come in soon, so he can tell you — *in detail* — the many advantages of the AO Plan.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS



The ADAMS Gear Hobber and Thread Miller

The Adams Manufacturing Hobber is available when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the purchase of equipment for these operations only.

Here is a machine that combines precision with versatility. It hobs multiple splined shafts, spur gears and helical gears, and it will mill worm and screw threads.

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1883 — Our 62nd Year — 1945

SIGOURNEY M-100

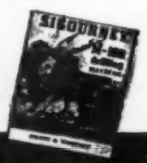
PRECISION MADE FOR PRECISION RESULTS

The Sigourney M-100 Bench Drilling Machine provides the rigid, accurate construction that means maintained precision over a long service life.

Completely enclosed for operator safety . . . sealed ball bearings throughout . . . hardened and ground spindles . . . standard speed range from 4000 to 10,000 RPM, other ranges available . . . manufactured in models from 1 to 6 spindles.

Send for Illustrated Bulletin

THE SIGOURNEY TOOL CO.
Hartford 6, Conn.

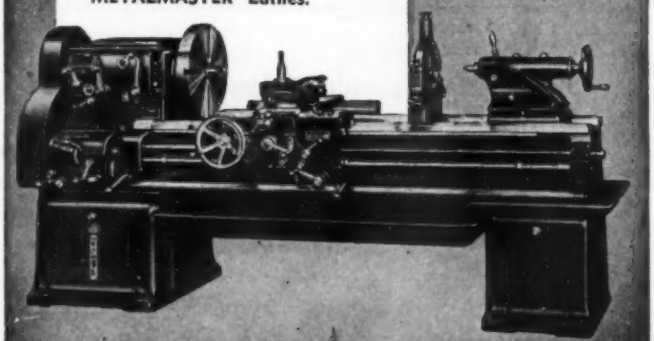


Sole Sales Agents
PRATT & WHITNEY
Division Niles Bement-Pond Co. - - - West Hartford, Connecticut

Metalmaster

- Fast, accurate for war production . . . durably constructed, precision built to meet peacetime manufacturing needs. Write for catalogs describing in detail the advantages of METALMASTER Lathes.

12", 14" & 16" LATHES



The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

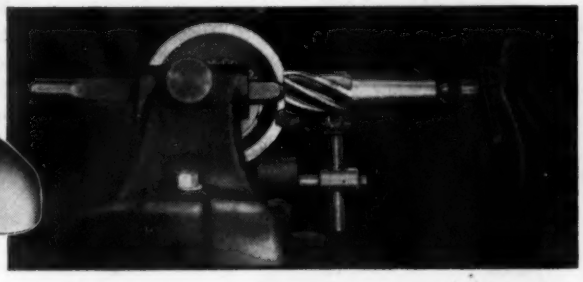
659 EVANS AVE. . . . CINCINNATI, OHIO

You Need Them In Modern Machining

- **ENOUGH CUTTERS AND TOOLS**
- **PRECISION SHARPENED**
- **ALL THE TIME**

and You'll get them with the COVEL No. 22 Universal

Grinding cutting clearance on end milling cutter. A cup wheel is mounted on the No. 22 for this operation. Tooth to be ground is located by centered tooth rest. Cutter is held securely between centers in tail stocks.



The COVEL No. 22 is fully equipped to handle *all* your cutters and tools . . . sharpen them quickly and accurately . . . get them back on the job in a hurry!

No danger of worn cutters and tools piling up, when there's a COVEL No. 22 in your toolroom. Set-ups are simple, easy to change. And the rugged construction of the No. 22 means long, profitable life. Get full information today!

See Your Nearest Covel Dealer or Write for Bulletin A-205.

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

Hammond
OF KALAMAZOO

ABRASIVE BELT GRINDERS-POLISHERS

Model F-2 Flexible Belt

Hammond offers in its wide line of abrasive belt machines—for either wet or dry operations—the highest standard of machine tool construction for economical, high production grinding and finishing. Write for bulletins.

Model "400" Wet-n-Dri 4" Belts

FLEXIBLE BELT UNITS

Inexpensive bench or pedestal type for replacing slow, costly hand finishing methods.

Model VH-6 Wet-n-Dri 6" Belts

GRINDERS—POLISHERS

Whatever your problem—investigate the available Hammond machine for handling it. Both bench and floor type Wet-n-Dri machines for use with abrasive belts from 2" up to 10" widths.

Model No. 5 Dri Only Up to 3" Belts

BACKSTANDS

Bench and floor types to convert polishing equipment into belt finishing units.

CYLINDRICAL FINISHING

Backstand and POLISHING LATHE UNITS

For faster, better, large volume finishing.

Variable Speed Lathe & Backstand

HAMMOND PRODUCTS — CARBIDE, GENERAL PURPOSE AND ABRASIVE BELT GRINDERS AUTOMATIC AND CYLINDRICAL FINISHERS • POLISHING LATHES

Hammond Machinery Builders

1618 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

Eastern Branch: 71 West 23rd Street, New York 10, N. Y.

The SUPER METHOD

of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind. Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.

Write for Your Free Copy

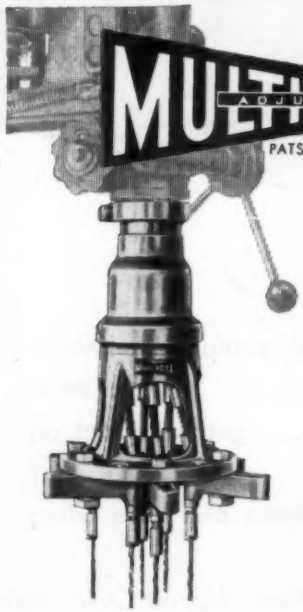
FRICTION SAWING *with* Tannewitz

HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

MULTI-DRILL
ADJUSTABLE

PATS. PENDING



Any Hole Pattern

Drill 6 Holes at One Stroke—Adjustable for *any* Pattern!

Your drill presses equipped with adjustable MULTI-DRILL heads will

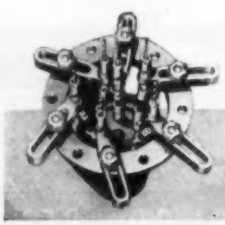
- Reduce costs thru multiplying your present drill press production
- Conserve valuable floor space in your shop or departments
- Reduce your equipment investment
- Often save their cost on the first job

The MULTI-DRILL attaches conveniently to most ½" drill presses. Its six radially adjustable spindles are quickly set to any hole pattern within 5" circle—11/16" minimum centers. Standard capacity 3/32" to 17/64" drills. Many modifications are available for your special applications at slight additional cost.

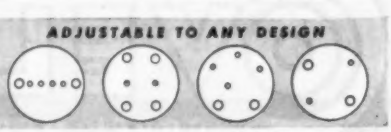
Write today for circular.

COMMANDER MFG. CO.

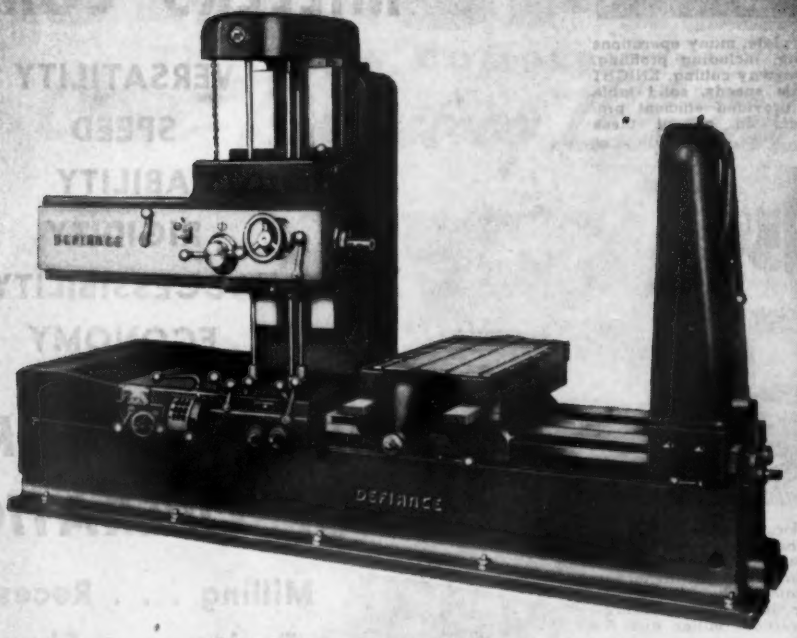
4229 Kinzie St., Chicago, U.S.A.



ADJUSTABLE TO ANY DESIGN



HORIZONTAL BORING MILL



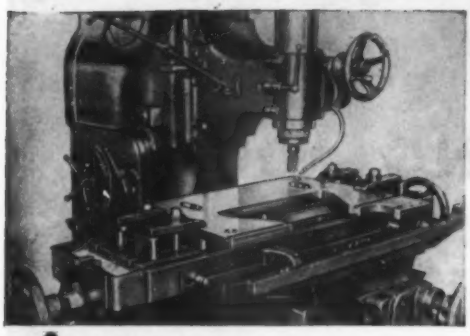
● Defiance No. 22 horizontal Boring, Milling, Drilling and Tapping Machine has 2½" dia. spindle . . . rugged, simple and accurate for wide range of precision work in tool rooms. Speed and feed mechanism, and spindle housing are of unit construction.

Positive infinitely variable speeds from 25 to 1600 R.P.M. in either direction directly on the main spindle gives complete range of speeds on one spindle. 18 feeds in geometric progression, ranging from .002 to .125 per revolution of spindle. Five feeds are standard tapping leads. Column ways are 5" x 1½" and 18" across. Bed ways are 5" x 1½" and 24" across. Table ways are 4" x 1½" and 21" across. 24" x 36" table has working surface of its entire area with "T" slots and cross slots. Write. Defiance Machine Works, Inc., Defiance, Ohio.

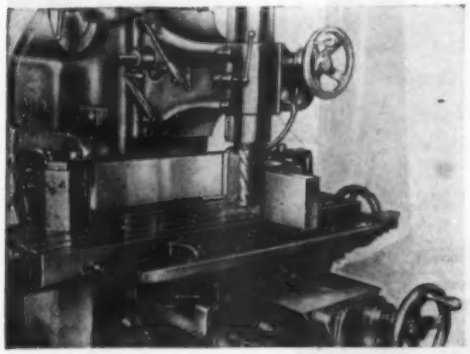
ARMY E NAVY

DEFIANCE

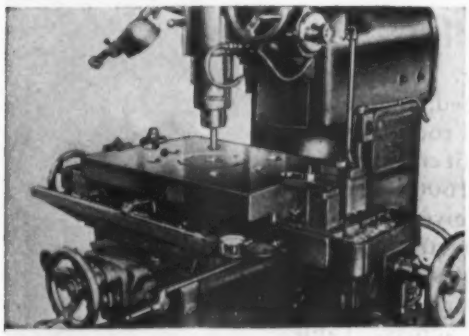
BUILDERS OF PRECISION MACHINERY SINCE 1850



● On the large one-inch steel plate, many operations were performed at one setting, including profiling, milling, boring, slotting, and keyway cutting. KNIGHT Miller's wide range of spindle speeds, solid table unit, and ease of handling provided efficient production and accurate results on all of these operations.



● Illustration shows a large forging on which a two-inch diameter cutter, six inches long, was used to remove as much as five-sixteenths inch of stock in some places without appreciable spindle deflection. The forging was machined completely all over and met with rigid inspection for finish and tolerances. A good, stiff job for any vertical miller and the KNIGHT took it.



● Handling a boring job on an eighteen-inch by twenty-nine inch plate, two inches thick. Nine holes, ranging from one and one-eighth inches to two-inches diameter, were accurately bored to limits of plus or minus .0005". Dial indicators for quick and accurate locating, a large accurately fitted spindle to insure round and straight holes, and table slides that are square made the KNIGHT Miller ideal for the job.

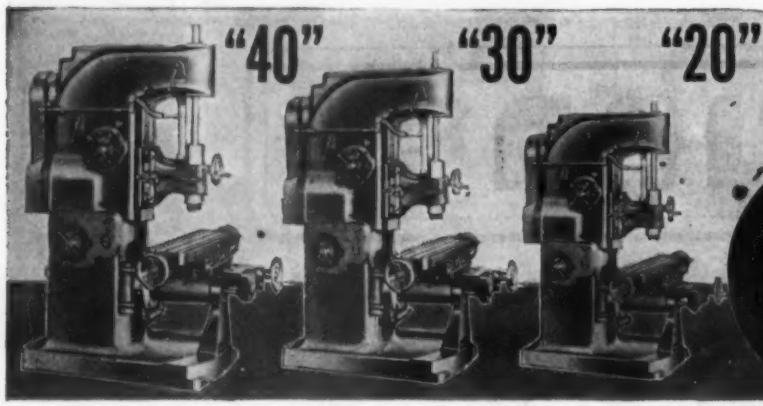
KNIGHT
UNIVERSAL VERTICAL MILLERS COMBINE

VERSATILITY
SPEED
ABILITY
RIGIDITY
ACCESSIBILITY
ECONOMY

FOR A WIDE RANGE OF OPERATIONS

Milling . . . Recessing
Boring . . . Shaping
Drilling . . . Routing
Turning . . . Backfacing
Surfacing . . . Slotting
Counterboring . . . Profiling

And you have the advantage of changing quickly from one job to another—at all times you are equipped for unusual capacity. Where speed and convenience are required, KNIGHT Millers deliver—where power and rigidity are required, KNIGHT Millers are fully able and give you more efficient operation, faster manipulation, and quicker set-ups.



KNIGHT VERSATILE MILLERS ACCURATE-RIGID

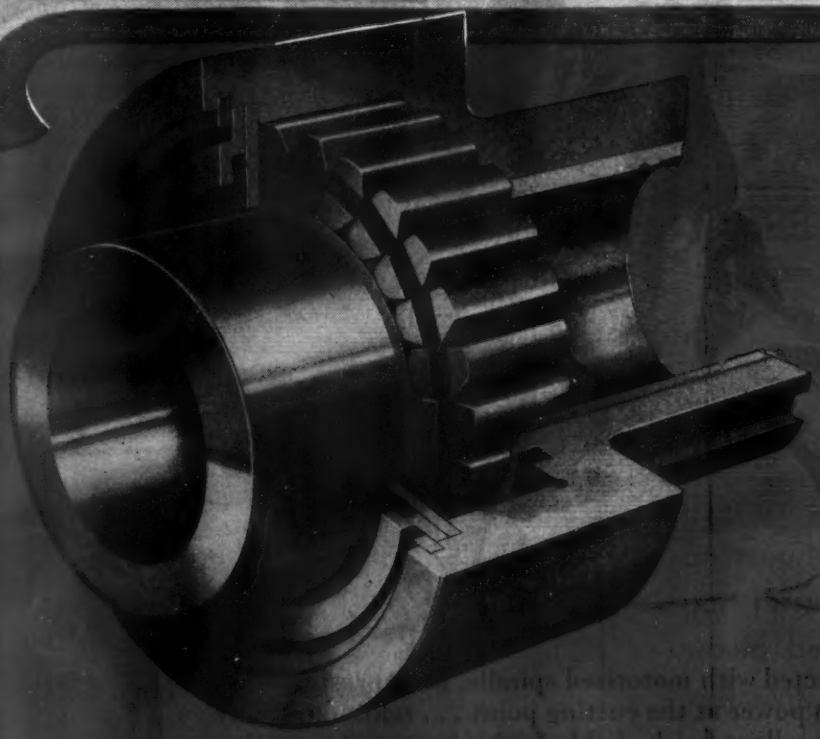
W. B. KNIGHT MACHINERY COMPANY
St. Louis 8, Mo.

Get the Facts About

FORMSPRAG

THE FULL COMPLEMENT

Over-Running Clutch



The FORMSPRAG consists of inner and outer members which form a cylindrical, annular space completely filled with energized sprags. ¶ Torque is delivered through many points of contact, with an infinite number of "stations". Once torque is removed the sprags release--instantaneously. ¶ This simple design permits the greatest possible torque capacity for size and weight.

For full information, write for folder, and outline your requirements.

The GEAR GRINDING MACHINE COMPANY

DETROIT 11, MICH. U.S.A.

ABRASIVE M-34

VERTICAL SPINDLE SURFACE GRINDER

HEAVY POWERFUL ACCURATE

Centuries ago when metal working was a matter of personal skill and craftsmanship, the medieval knight staked his life on the ability of his armorer. Today you can safely stake your production on the metal working ability and accuracy of ABRASIVE *Surface Grinders.*

Massively constructed with motorized spindle, the Abrasive M-34 delivers maximum power at the cutting point . . . takes unusually heavy cuts with excellent finish. Table feed is automatic in either direction and of ample speed; length of stroke is positively controlled by adjustable dogs. Automatic down feed provided. The M-34 is reliable, accurate . . . easy to operate, adjust or repair. It grinds to close tolerances *immediately* upon starting and maintains these tolerances throughout production runs.

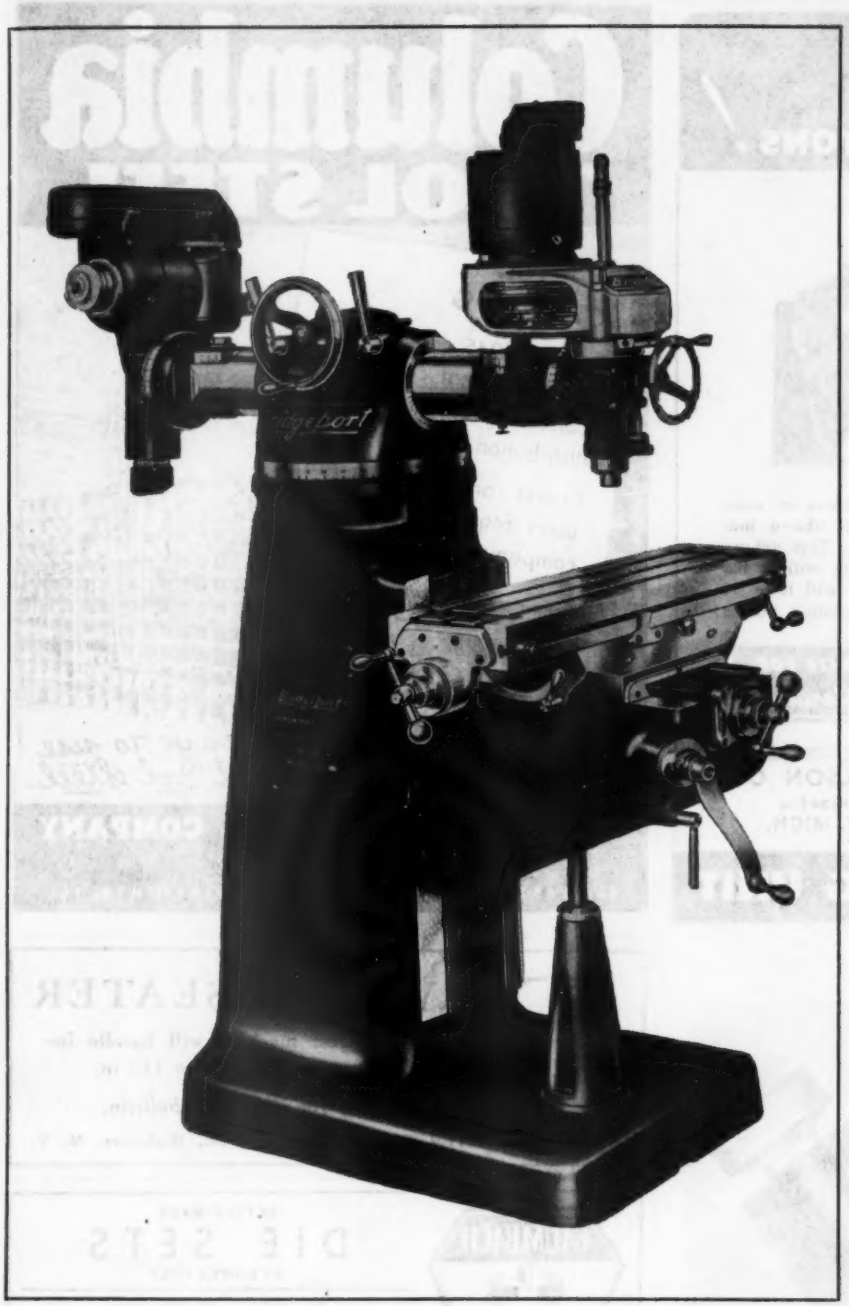
Ask for descriptive bulletin.

If you will send us the serial numbers, we will gladly supply any information in our files regarding ABRASIVE Machines on the U. S. Gov. surplus machine tool list, and will endeavor to furnish attachments, accessories and repair parts as required.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL COMPANY • EAST PROVIDENCE 14, RHODE ISLAND



Bridgeport

TURRET MILLING MACHINE

If space saving alone were an important factor, Bridgeport Turret Milling Machines would be a profitable investment, because in a single machine are combined milling, boring, drilling and shaping at all angles. However, the "Bridgeport" offers all this plus a big saving in time because all operations can be performed without disturbing work set up. Many cost-cutting machines are available for the price of one . . . when you buy the "Bridgeport."

Investigate NOW.

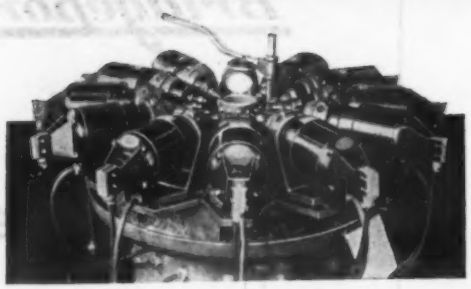
Specifications

Longitudinal Feed—20"
Cross Feed—9"
Vertical Feed of Knee—16"
Standard Table—9" x 32"
Special Tables up to 48" available; also longitudinal power feed.
Weight with Shaping Unit—2000 lbs.

The **Bridgeport**

MACHINES, Inc.
Bridgeport, Conn.

DRILLING SMOKE HOLES IN PISTONS!



Govro-Nelson Drilling Units drill all smoke holes at once at the rate of 220 pistons per hour on the above machine at Thompson Products, Inc., Cleveland. This set-up, arranged for 12 Model "E" Govro-Nelson Units with a fixture engineered by Thompson Products, Inc., will take 50 different pistons. The number of units in operation varies with the requirements of each type of piston.

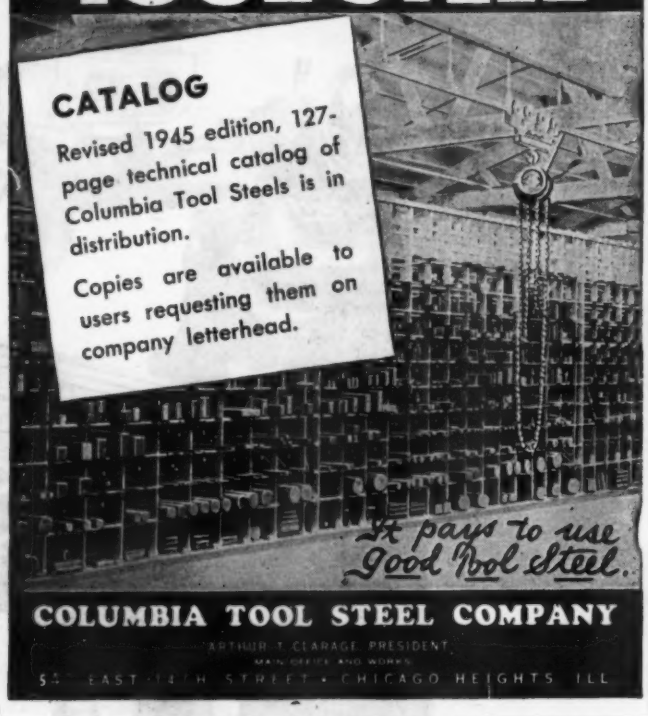
If you have a job involving the multiple drilling of holes up to ⅜", Govro-Nelson Units will help reduce costs.

WRITE FOR *Literature*

GOVRO-NELSON CO
1933 Antoinette
DETROIT 8, MICH.

Automatic DRILLING UNIT

Columbia TOOL STEEL


CATALOG
Revised 1945 edition, 127-page technical catalog of Columbia Tool Steels is in distribution.
Copies are available to users requesting them on company letterhead.
It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
55 EAST 12TH STREET • CHICAGO HEIGHTS, ILL.

GREEN MASTER FEED FINGERS

FOR AUTOMATIC SCREW MACHINES

CUTAWAY VIEW SHOWING SYNTHETIC INSERT

DO NOT SCRATCH

The *synthetic rubber insert*, distinguishing feature of GREEN Master Feed Fingers, will not cause any scratches or other disfiguring and scrap-making marks to appear on even the softest stock. *Check NOW* on this and many other distinctive, time-saving, money-saving features of GREEN Master Feed Fingers!

GREEN MANUFACTURING CO.
650 S. WYMAN ST., ROCKFORD, ILLINOIS

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

BAUMBACH STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST

46 Styles—195,000 Sizes

E. A. BAUMBACH MFG. CO.
Machined Steel Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING *Units*

½ to 20 HORSEPOWER DRIVE

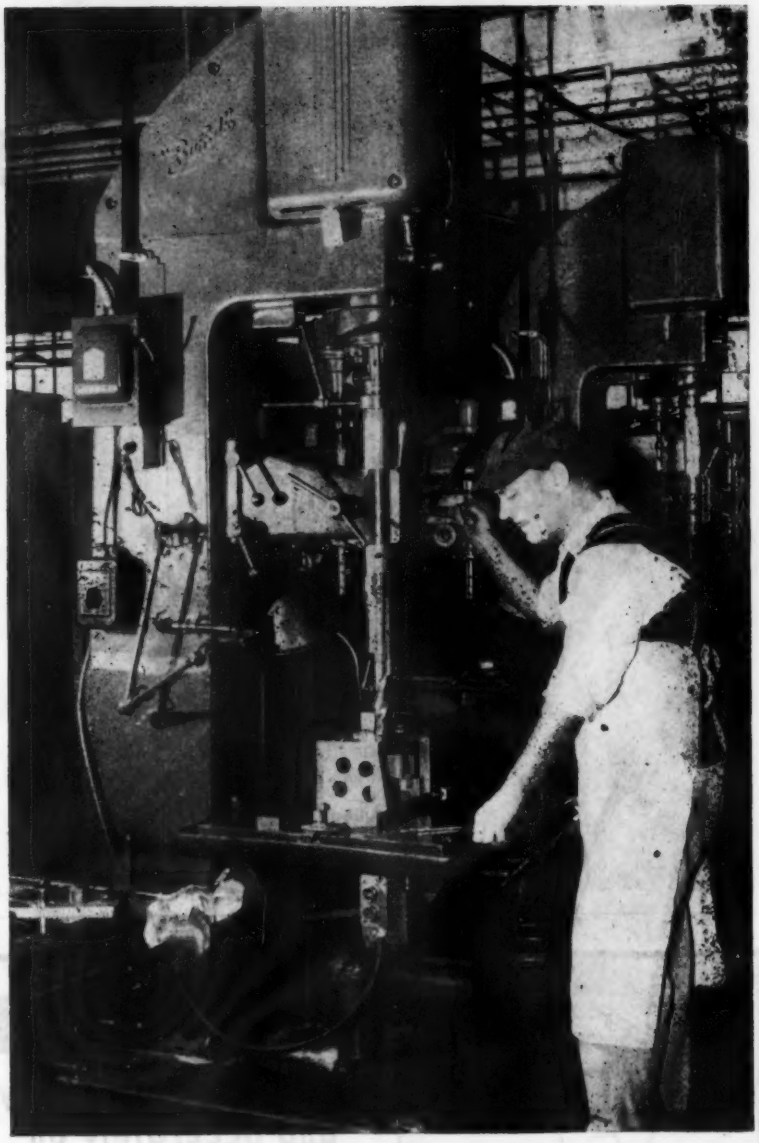
AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

FILLING AN *Important* PRODUCTION *Need*

"Buffalo"

HEAVY DUTY Motor Spindle DRILLS



If your schedules call for accurate, heavy-duty drilling or tapping . . . and plenty of it **in a hurry** . . . "Buffalo" Motor-Spindle Drills are just the rugged expediters to keep operations **moving!** Despite their size, they are easy to operate and quick to change for varying set-ups. Full data in Bulletin 3285-A, on request.

2 Sizes — 1" and 1½" Capacity in Cast Iron.

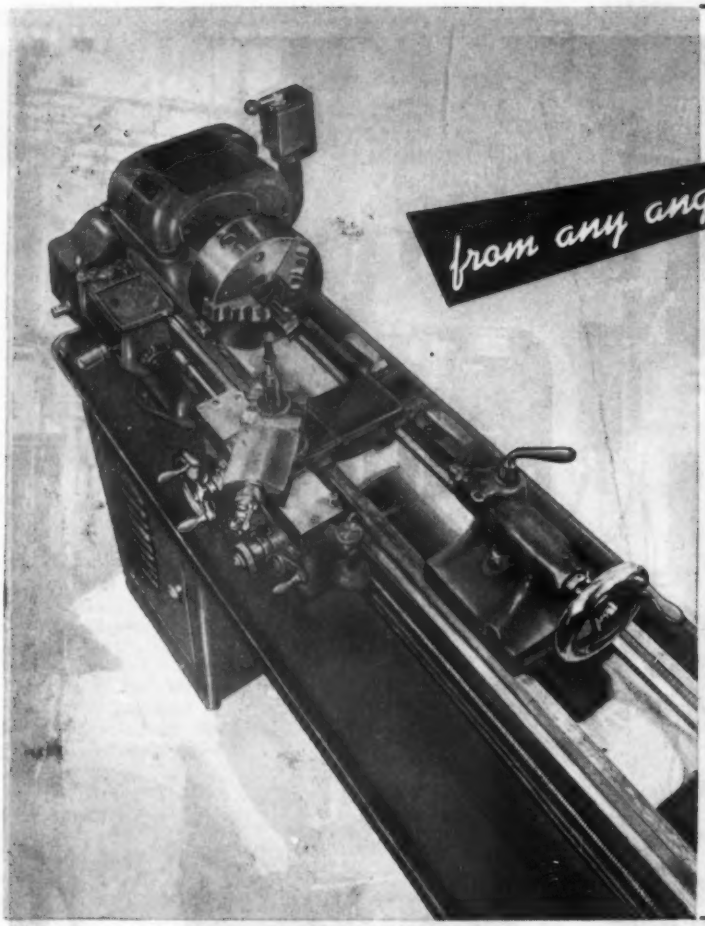
With or Without Back Gearing, Power Feed and Motor Reverse for Tapping.

Available in from One to Six Spindles.

BUFFALO FORGE COMPANY
448 BROADWAY **BUFFALO, N. Y.**

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **Motor-Spindle DRILLS**



from any angle...

SHELDON

S-56 LATHE

. . . compare a SHELDON S-56 Precision lathe with all other 10" lathes in the moderate priced field, and you'll find more accuracy, more capacity, more convenience, more design, more quality . . . *from any angle just more lathe.*

The SHELDON S-56 lathe has a bed length of 56", with rigid T-girted bed with 2 V-ways and 2 Flat ways which are ground and hand scraped to .0005" of both lateral and parallel alignment. Lead screws are cut on the finest Pratt & Whitney "super precision" lead screw machine. The S-56 lathe with 56" bed is mounted on a rigid 5 drawer steel bench (S-44 with 44" bed on a 4 drawer steel bench) which houses an efficient 4-speed (8 spindle speed) underneath motor drive. Each come with full quick change gears, power longitudinal and cross feeds and standard big lathe features.

- Heavy bronze bearings
- 1" Collet capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

SHELDON MACHINE CO., INC.

42 N. Knox Ave. Chicago 41, U. S. A.

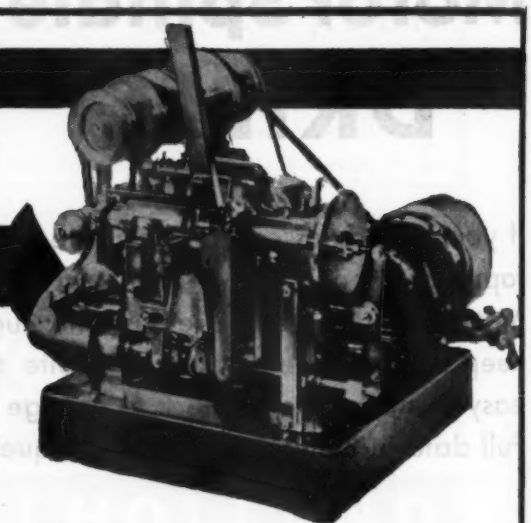
Builders of Good Lathes Since 1919

Parts like these

are produced quickly and accurately on

WALTHAM

PINION & GEAR CUTTING MACHINES



These bench machines, for cutting fine pitch gearing, such as those used in watches, instruments, time fuses, etc., employ a revolving cutter which makes successive cuts. Blanks are held and indexed by the work spindle. Only straight cuts can be made.

Cutter spindle is designed for high speeds. The entire machine is sturdily built for precision and long life. Each type machine is convenient, easy to operate and highly productive.

Full details and specifications are available on request.

Available in the following Types

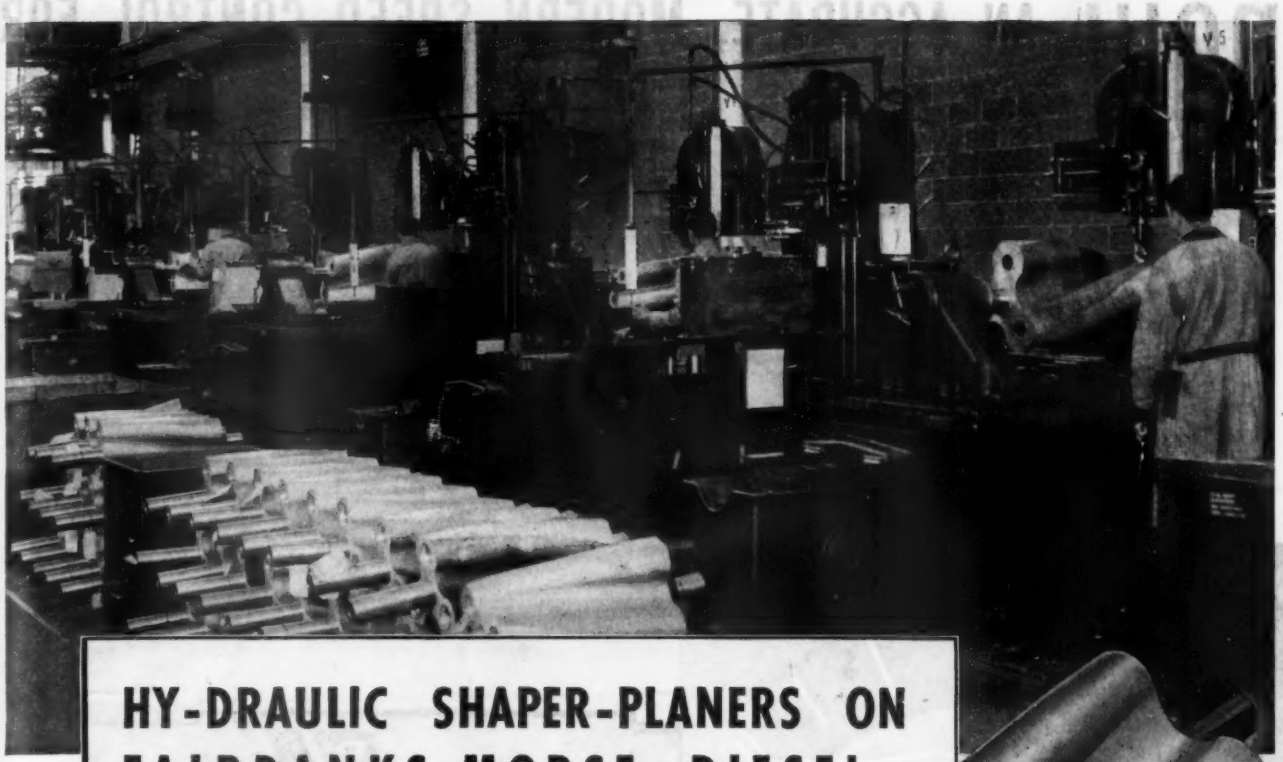
In each of the following machines, the same cutting method is used, namely a revolving cutter which makes successive cuts on blanks held and indexed by work spindle.

Single-Cut Pinion Machines, Multiple-Cut Pinion Machines, Magazine-Fed Pinion Machines, Gear Cutting Machines

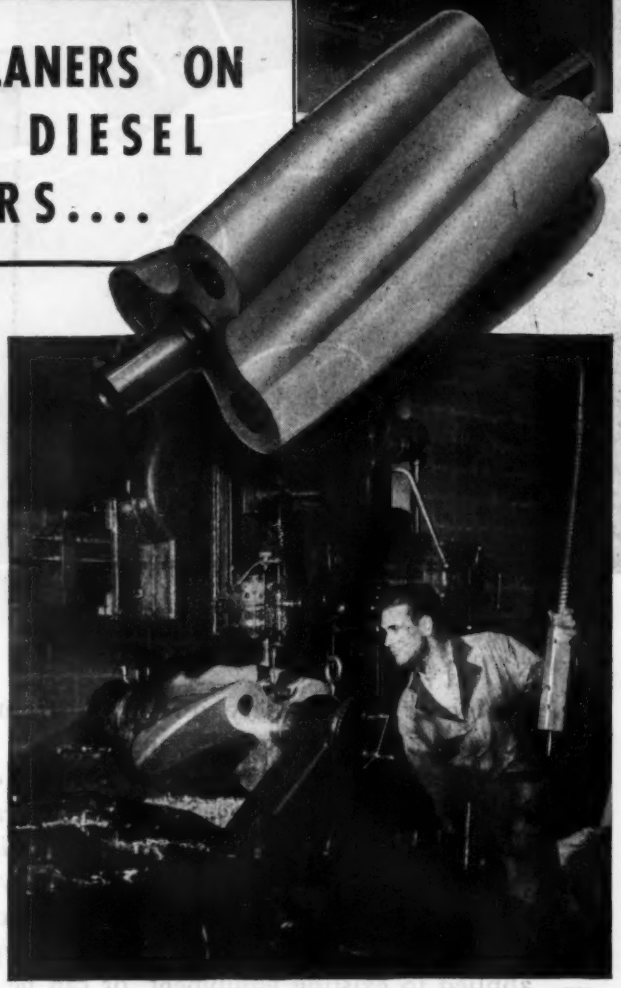
CAPACITY: Pinion Machines, ½" dia.
Gear Machines, 1½" pitch dia.

WALTHAM
TRADE MARK
REGISTERED U.S. PAT. OFF.

WALTHAM
MACHINE WORKS,
WALTHAM, MASS.



HY-DRAULIC SHAPER-PLANERS ON FAIRBANKS-MORSE DIESEL BLOWER IMPELLERS....

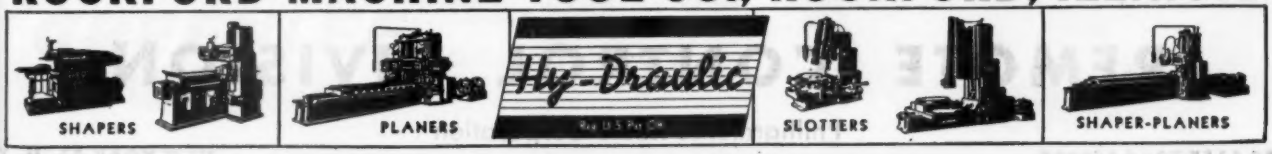


Selected as original equipment for machining contours of Fairbanks-Morse diesel engine blower impellers, the installation of Rockford Hy-Draulic Shaper-Planers has grown to include the 8 machines shown above. For several years they have been running more than double time daily, and operating personnel has included several women. When permitted by the impeller schedule, several of the Shaper-Planers have been reverted to standard and used on high-priority tool and die work.

Rockford Hy-Draulic Shaper-Planers machine many other kinds of blower impellers and work-pieces having irregular shapes or contours. Hy-Draulic Shapers and Planers handle similar work in smaller and larger sizes respectively. They, too, can be reverted to standard for conventional shaping and planing. Investigate. Send drawings or samples for a sales engineering production proposal. Write to Department 1127.

4511

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS



NOW AN ACCURATE, MODERN SPEED CONTROL FOR *Variable Speed Transmissions!*

No longer is it necessary to follow instruments or dials in attempting to obtain accurate settings of Variable Speed Transmissions.

With the new P. R. Remote Control, the desired speed is *pre-set,* or *changed,* merely by turning the dial to the desired speed. The transmission then assumes the position to deliver the selected speed. And the setting is *quick,* and *highly accurate,* due to the new but extremely simple all-electric circuit employed.

This compact P. R. Precision Remote Control can quickly be hooked-up to any Variable Speed Transmission of the variable ratio type, either mechanical or hydraulic. It is readily applied to existing equipment, or can be supplied by equipment builders, on request. *For complete information, write . . .*

REMOTE CONTROL DIVISION

Philharmonic Radio Corporation

328 EAST 72nd STREET — NEW YORK 21, N. Y.

A Subsidiary of American Type Founders, Incorporated

"READ ALL ABOUT IT . . ."

NEW BOOKLET
. . . JUST OUT!

Sixteen fact-packed and well-illustrated pages tell you the salient points and many of the significant details of the Greenlee Six . . . and give you specification figures from which you can judge how well this machine will fit *your needs.* We have gone easy on the glittering adjectives and tried, instead, to tell a straightforward story of all the things a Greenlee Six can do, and how they are accomplished. *Send for your free copy today . . . if you are interested in production machinery, you will find it worthwhile reading.*

GREENLEE "6"

AUTOMATIC SCREW MACHINE

Here is a machine that was designed with three principles in mind . . . (1) to provide accurate high production, (2) to make operating easier, and (3) to make set-ups faster. Many details of design contribute effectively to the accomplishment of these aims, such as wide open tooling area, built-in coolant system, highly refined and accurate spindle and carrier construction, compensating stops, identical cross slide tool cavities, simple cross slide camming, no cams on main tool slide, convenient stock feed adjustments, and a variety of attachments for threading, tapping, reaming, drilling, recessing, boring, form-turning, and eccentric boring. The unusual qualities of the Greenlee Six have often earned it the title of "The Operator's Favorite."

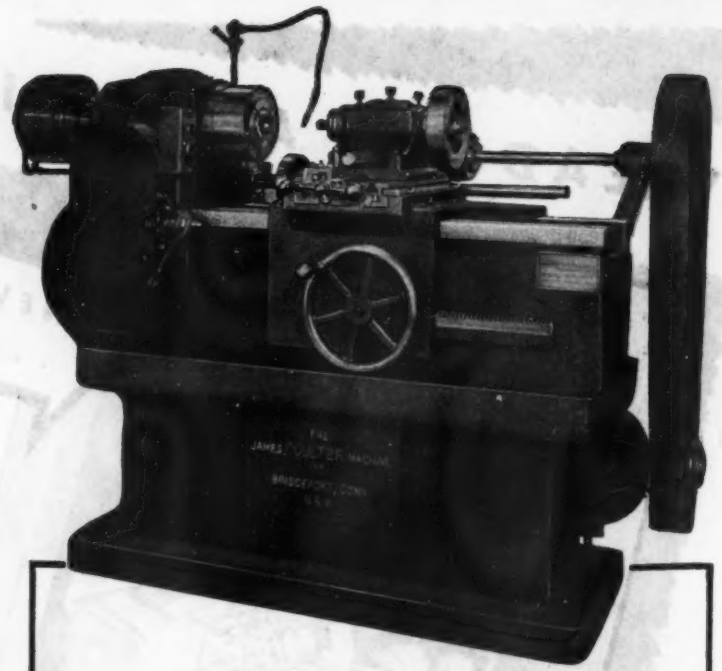
PRODUCTION MACHINERY
GREENLEE

Right, two typical spreads in the booklet shown above, to give you an idea of how thoroughly and carefully the significant facts on the Greenlee Six are presented.

GREENLEE BROS. & CO.
1729 MASON AVE., ROCKFORD, ILL.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

Keep Ahead of DEFENSE DEMANDS on the PRODUCTION of EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

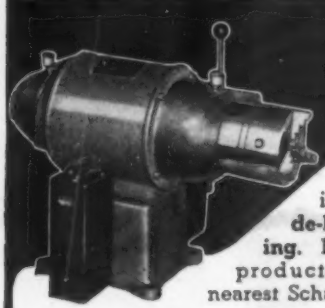
Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.
BRIDGEPORT · CONNECTICUT · U.S.A.

IDEAL SPEED LATHES



For accurate, uniform, speedy finishing of metal & plastic parts.

. . a type and size for every secondary finishing operation—**polishing, de-burring, lapping, grinding.** For lower-cost peacetime production, write or call your nearest Schauer representative:

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Motch & Merryweather Machy. Co., Cincinnati 2, Cleveland 13, Pittsburgh 22
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The Satterlee Company, 118 Washington Ave., N., Minn. 1
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Triplex Machine Tool Corporation, 125 Barclay St., New York 7
Harron, Rickard & McCone Co., Los Angeles 11, San Francisco 10
W. W. Wentz, 121 Powers Hotel, Rochester, N. Y.
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AWARDED October '42

SCHAUER MACHINE COMPANY
ORIGINATORS OF TODAY'S SPEED LATHES
2087 Reading Road Cincinnati 2, Ohio

Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

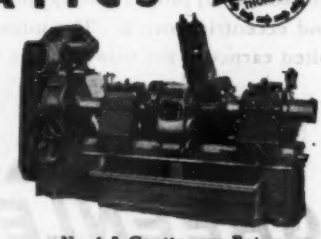
MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

Sensitive DRILLING MACHINES Avey
CINCINNATI OHIO

Horizontal ROTO-MATICS

DAVIS and THOMPSON Roto-Matic

When high production is in demand on your machining problems your requirements can be met with a Horizontal Roto-Matic. Continuous, non-indexing operation together with roughing and finishing spindles insure maximum output. *Bulletins 110 and 120* are available for suggested solutions to your problems.



No. 1-A Continuous Rotary Drum Type Miller

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

. . . "Comfortable as an Old Shoe"

There's plenty of talk these days about functional machine design—design that, among other things, makes it easy and safe for the operator and maintenance man..We at Hendey are all for it, and have been for seventy years.

That's why it's easy to spot a Hendey Tool Room Lathe operator. He looks as if he's getting the work out, *and he is,* because a Hendey operator can concentrate on just that. He can get close to his machine and his work because there are no overhanging knobs and levers. He doesn't have to be a gymnast with a "boarding-house reach"; neither does he have to be a fancy dancer. He can stand in one spot and operate the few simplified controls with easy, natural motions.

This goes for the maintenance man too. Automatic lubrication is the rule, individual oil cups the exception. Occasional adjustments can be made easily and quickly without tying up the machine.

No wonder operators and maintenance men feel that a Hendey Tool Room Lathe is "Comfortable as an Old Shoe."

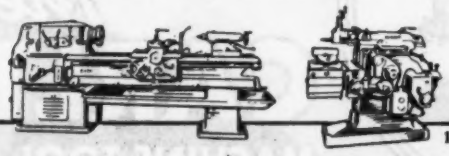
The Hendey Machine Company

Hendey

Main Office and Plant — Torrington, Connecticut

Branch Offices — New York, Chicago, Boston, Detroit, and Rochester

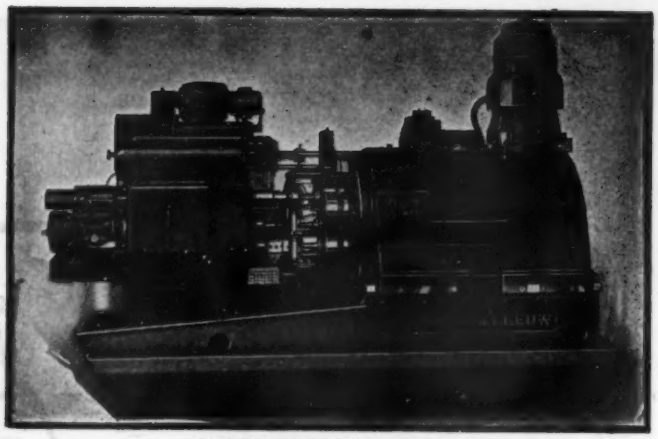
Representatives in — Phila., Cleveland, Los Angeles, Pittsburgh, San Francisco



TOOL ROOM LATHES
12"-16"-18"

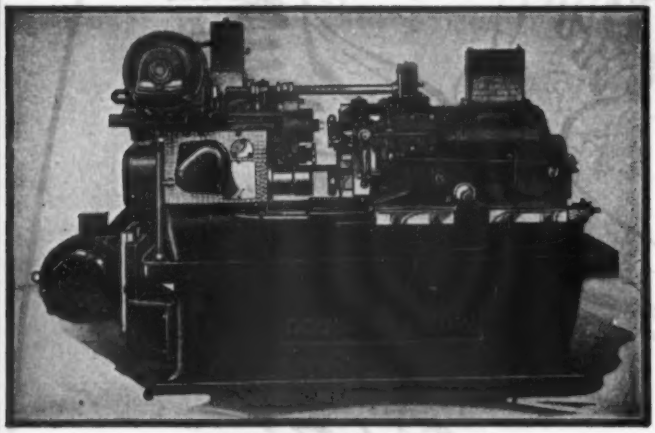
SHAPERS
12"-16"-20"-24"-28"

GOSS & DE LEEUW
Multiple Spindle
CHUCKING MACHINES



WORK ROTATING TYPE

5 Spindles • 6 Spindles • 8 Spindles



TOOL ROTATING TYPE

4 Spindles • 5 Chucking Positions

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.

Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

STANDARD US HEADS SINCE 1915

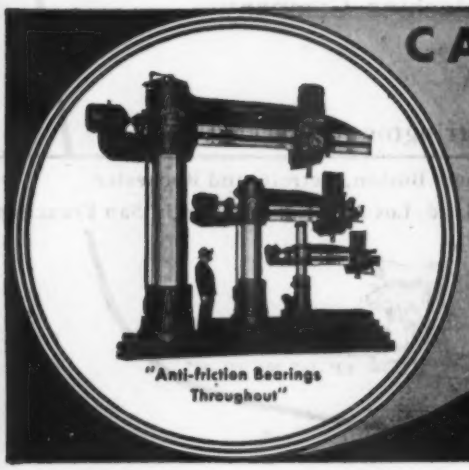
All Types of Fixed Center

DRILLING TAPPING & BORING HEADS

Four Spindle Head. All Spindles Adjustable for equally spaced holes.

FIVE TYPES, 56 SIZES, ADJUSTABLE DRILL HEADS

UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO



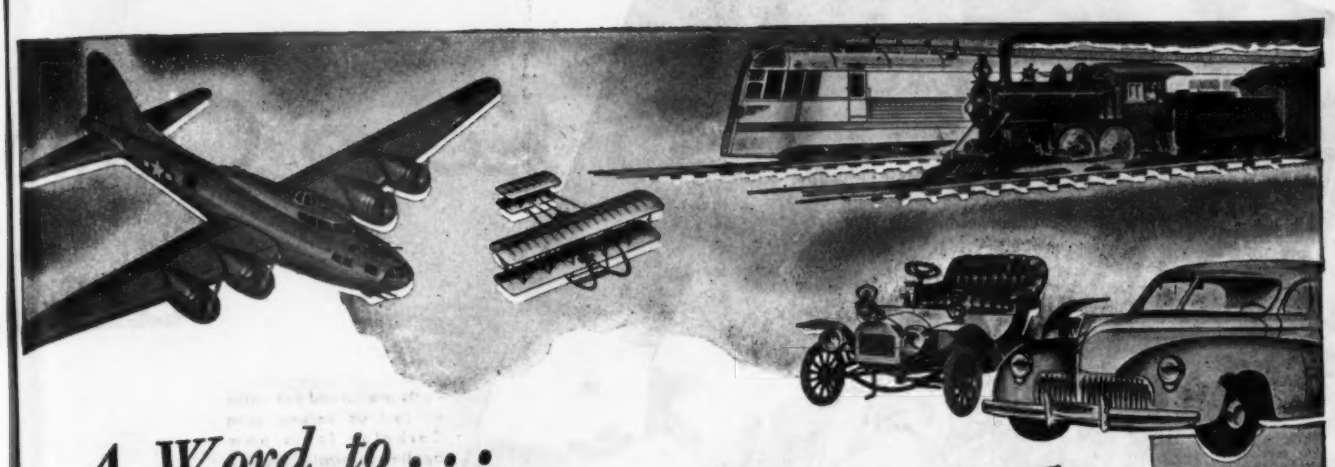
"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY



A Word to . . .

PLANT MANAGEMENT

● NOW is the time to modernize your plant—to get rid of inherited equipment and old, outdated equipment. Obsolete machinery reduces plant efficiency and increases manufacturing costs. And you cannot afford to handicap yourselves in the coming era of intensive competition.

Murchey machines and tools, modernized to the nth degree, proved their capacity, during the rigorous needs of war, to speed up production and to deliver precision and volume production. Their cost-cutting, time-saving, speed-assuring role is just as important NOW!

For over 40 years, Murchey Self-Opening Die Heads, Collapsible Machine Taps, Thread Milling Machines, Tapping Machines, Bolt and Pipe Threading Machines, and all other threading tools, have been recognized as the standard by which all threading equipment is judged and evaluated.

Murchey continues "Ahead of The Times"! In greater numbers than ever before, industries faced with any variety of threading problems, turn to Murchey as the organization best qualified to help them out of their difficulties. And Murchey pledges its resources—trained skill—engineering leadership — to maintain their confidence. Past, Present and Future, the same always holds true . . . *"You Can Depend on Murchey."*

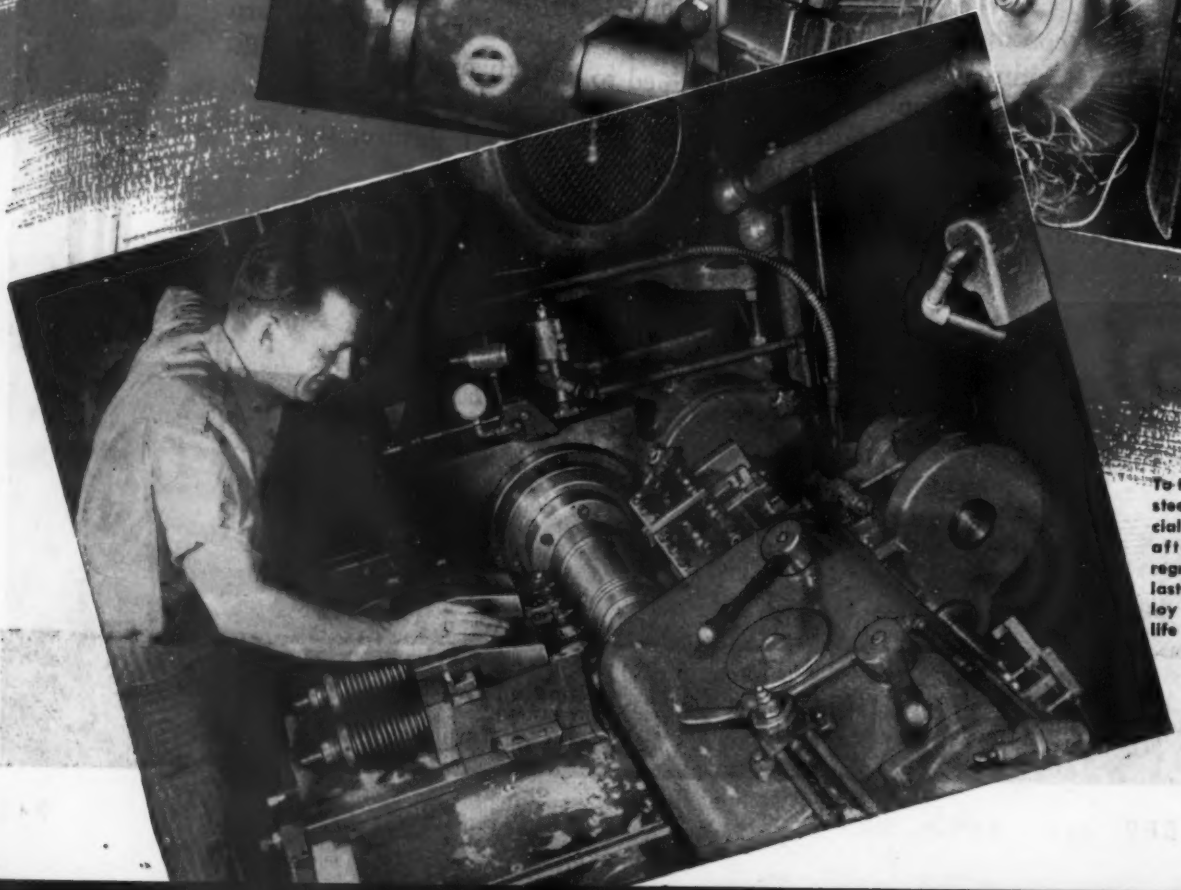
MURCHEY MACHINE & TOOL COMPANY
DETROIT 26, MICHIGAN

MURCHEY

Keep Costs
and

Parts are turned out twice as fast as before, with Carboloy tools now applied to turning, facing and form grooving of this steel gear.

Standard Carboloy tools —Grade 788—eliminate 19 tools and 75% of the hand finishing time previously required on this steel aircraft engine part.



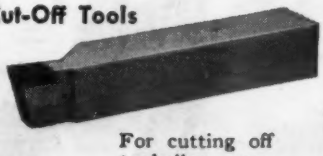
To turn, face, groove steel cylinder sleeve cial alloy tools were after each 4 pi reground each 12 p lasted only 2 days. C loy tools increased life 1500%.

DOWN... Quality Production · UP!

with these CARBOLOY Standards

(TRADEMARK) CEMENTED CARBIDE

Cut-Off Tools



For cutting off to hollow cores such as shell forgings, etc.

Tools for Roller Turners ("Box" Tools)

Grooving Tools

Available in widths over .060" through .330" Tolerances up to .0004".

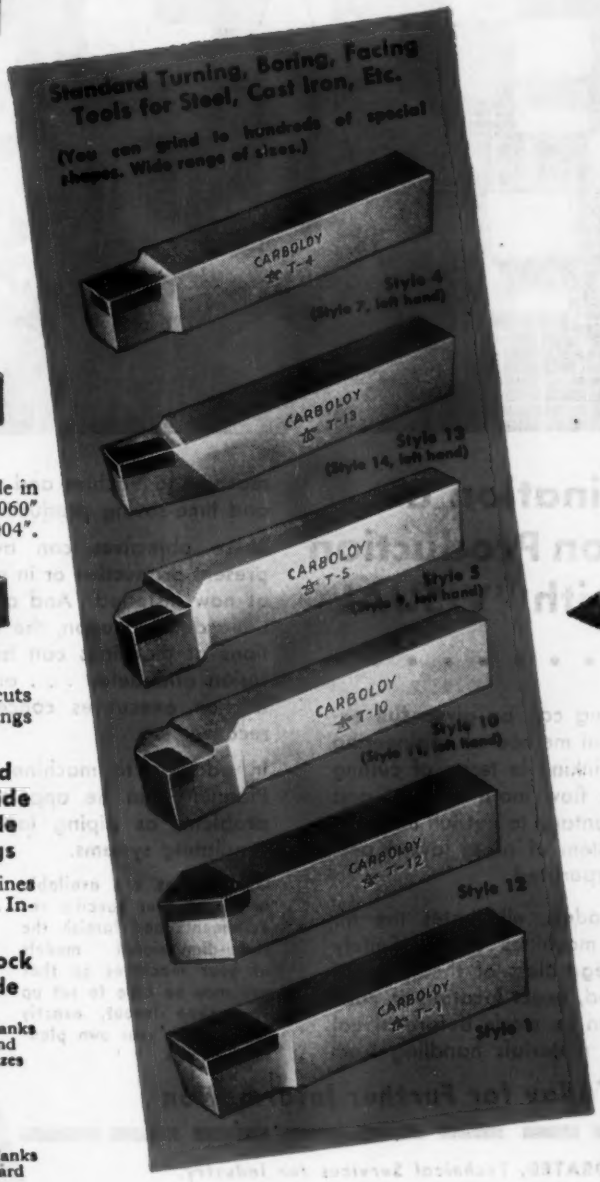
Shear Type Tools

For interrupted cuts on large forgings and castings.

Solid Carbide Guide Rings

For wear resistant uses on machines such as wire stranding machines. Increases life up to 50 times.

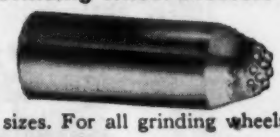
Special-Purpose Standard Stock Carboloy Cemented Carbide Blanks



Masonry Drills

Drill concrete, brick, etc. 75% faster than old methods.

Diamond Impregnated Grinding Wheel Dressers

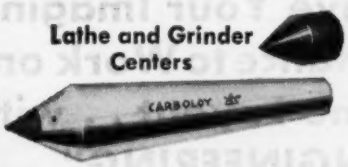


3 sizes. For all grinding wheels.

General-Purpose Standard Carboloy Blanks

Style 1000 Style 2000
Sizes 1/16" to ½" thick.

Lathe and Grinder Centers



(Up to 50 times longer life than steel.)
Carbide tips only.
Finished tipped centers (with Morse, B & S, and Jarno Tapers).

Precision Boring Tools

Precision "Boring" tools for high quality finish.
(You grind point to suit).

Send For Free Catalog

32-page catalog GT-175-R contains prices and specifications of all standard stock and standard design Carboloy Cemented Carbide tools. Write for your copy today.

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Sole makers of the Carboloy Brand of Cemented Carbides

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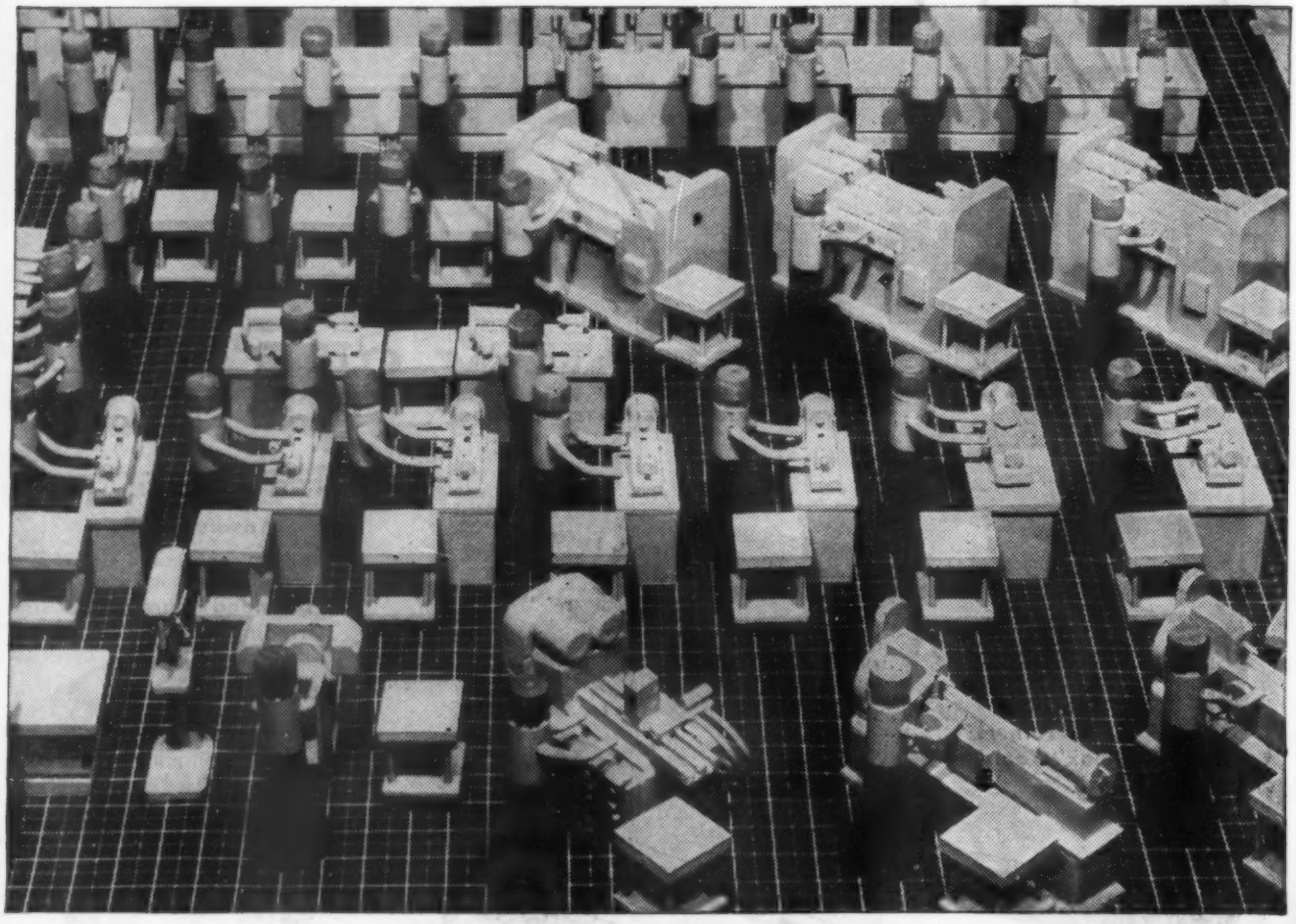
Also stocked and sold by Leading Mill Supply Distributors, coast to coast.

STANDARD **CARBOLOY** TRADEMARK **TOOLS AND BLANKS**



Give Your Imagination a Chance to Work on Production Line Layout . . with "VISUAL ENGINEERING" . . . . . .

Your ideas on production planning can be given full expression when you apply the visual method of engineering to machine layout. If you are thinking in terms of cutting costs through making production flow more efficient and economical, it will be to your advantage to get full information on the three-dimensional system of plant layout perfected by Harold L. Taylor, Incorporated.

This system, employing scale models, eliminates the hit or miss method of setting up machines and definitely establishes space requirements regardless of the types of machines involved. By this method, exact location of each and every piece of equipment can be made before actual installation and thereby simplify materials handling from machine to machine and make possible the most convenient and time-saving production lines.

These objectives can be achieved without interrupting present production or in any way interfering with machines as now installed. And once your ideas as to layout have been decided upon, the actual change over or new locations of machines can be made with least possible confusion and delay . . . an outstanding advantage to production executives concerned with difficult problems of reconversion.

In addition to machine layout, the technique of Visual Planning can be applied to advantage in solving such problems as piping layouts, electrical circuits, air, and ventilating systems.

Our services are available to survey your specific requirements and furnish the three-dimensional models of your machines so that you may be able to set up your shop layout, exactly to scale on your own planning boards.

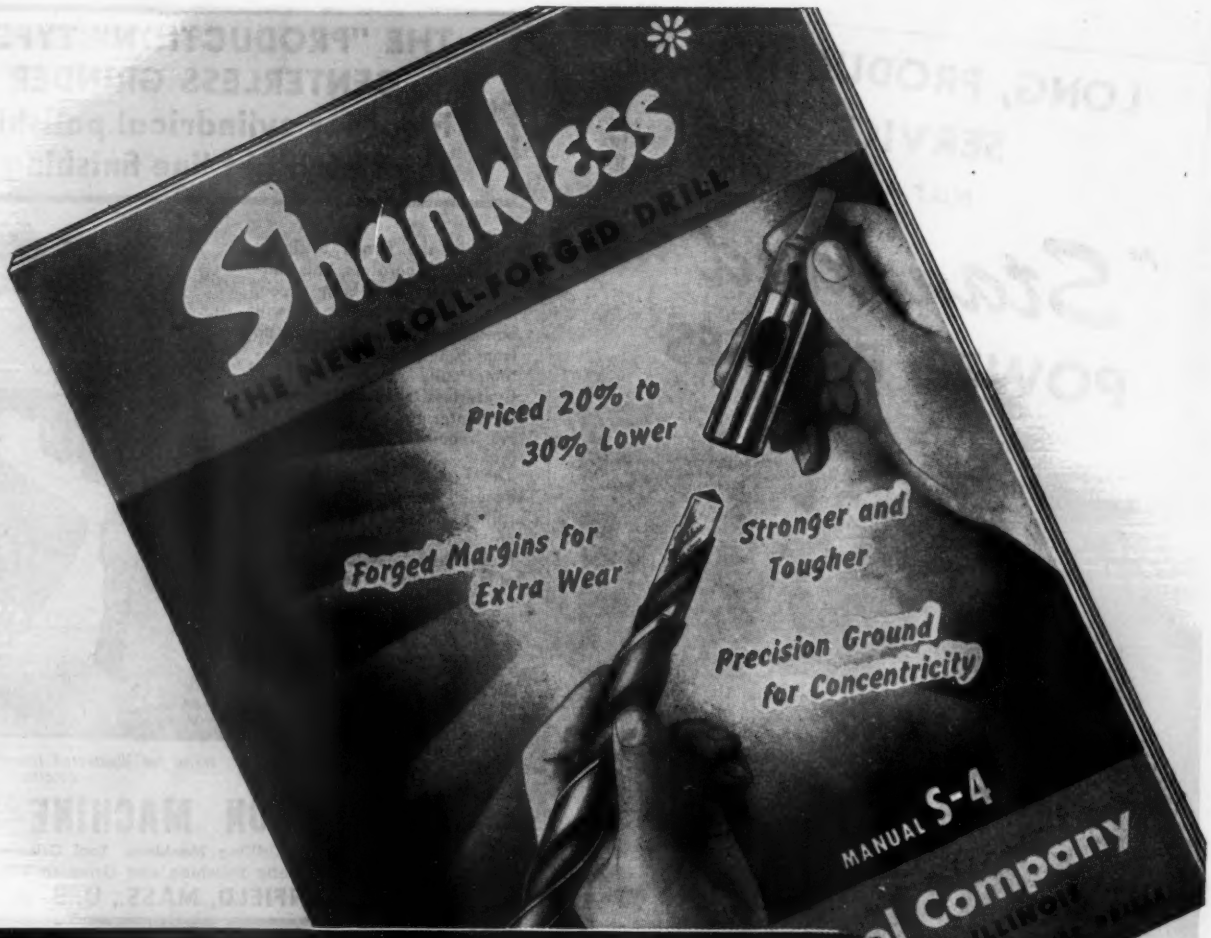
Mail Coupon Today for Further Information

HAROLD L. TAYLOR, INCORPORATED, ***Technical Services for Industry,***
101 Park Avenue, New York 17, N. Y.

Please send further details on your system of Visual Engineering in Shop Planning and Layout.

Name ..... Position .....

Company ..... Address .....



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● This is not just another drill catalog. It is more than that. It is a book of complete and detailed information about a new way to reduce drilling costs. It tells how one of the world's largest and most progressive manufacturing organizations developed this new kind of drill—has standardized on it for the past six years. If you are using drills, here is a way for you to cut production costs. The first step is to send for this book.

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WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF TWIST DRILLS

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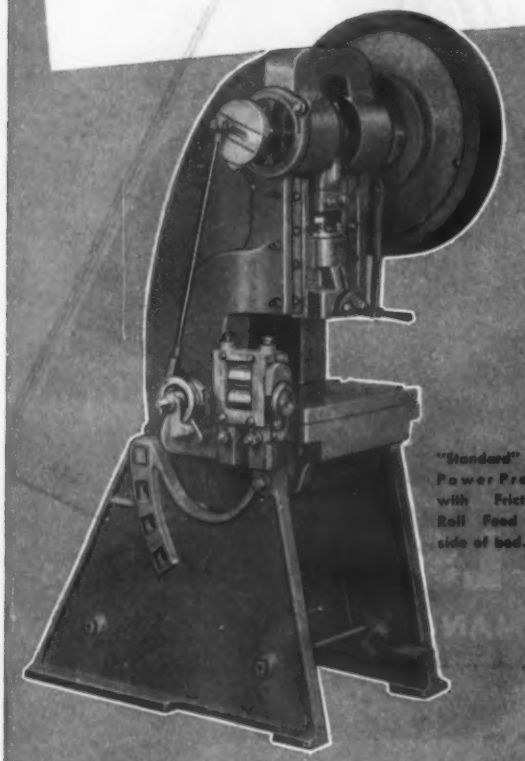
BUILT INTO

"Standard" POWER PRESSES



"Standard" 38-Ton Power Press with Friction Roll Feed at side of bed.

Furnished in crank or knuckle styles with direct or back geared drive. May be equipped with dial or friction roll feeds. Capacities to 400 tons.

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STANDARD MACHINERY CO.

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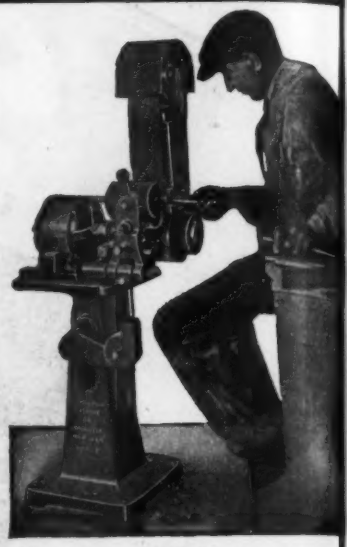
THE "PRODUCTION" TYPE S CENTERLESS GRINDER ideal for cylindrical polishing or straight line finishing

Even in the hands of inexperienced operators, this machine assures a high speed, fine, uniform finish. It will handle cylindrical work up from ¼" to 1" diameter automatically by means of Centerless Feed Attachment, no centering or chucking being required.

The Type S Machine can also be used for straight line finishing of flat work by hand manipulation. The flat surfacing bed is quickly removable, leaving the abrasive belt flexible for finishing irregular shapes.



SPECIFICATIONS

Abrasive belt—4" wide, 60" long
Motor 1 H.P., 1750 R.P.M.
Belt speed—3200' per min.
Dist. table to floor (Horizontal position) 36"
Table—4½"x13½"
Ball Bearing equipped

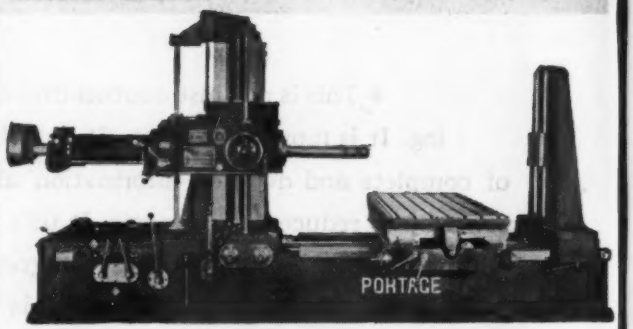
Write for illustrated literature giving full details.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

PORTAGE



NO. 4 HORIZONTAL BORING DRILLING & MILLING MACHINE

• A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

WRITE for full descriptive bulletin today.

THE PORTAGE MACHINE CO.

AKRON 11, OHIO

The Leader in it's field

MODERN SELF-OPENING STUD SETTERS

Used by practically every automobile, truck, tractor, diesel engine manufacturer and others with studs to set in quantity.

As the action of the tool is positive and automatic, it can be operated in any position with either air or electrically operated portable tools. It can also be used in a drill press, where it is possible to drill and tap the holes and set the studs in successive operations.

The three simple MODERN steps to speed, economy, and convenience in stud setting are illustrated at the right.

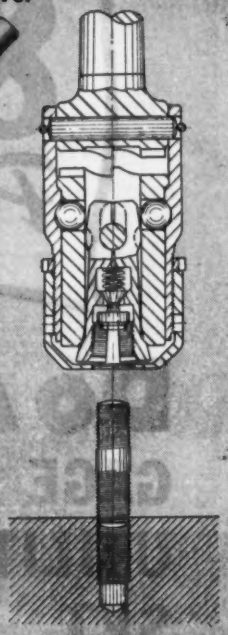
At the top . . . jaws open to take the stud.

Middle . . . driving position, jaws locked on stud.

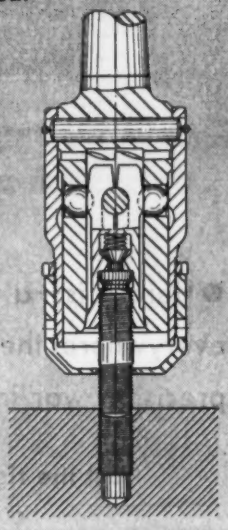
At the bottom . . . stud driven to full depth. The stop collar contacts the work and releases the clutch. Lifting the tool opens the jaws.

The tool revolves in one direction, no reversal, for the complete job.

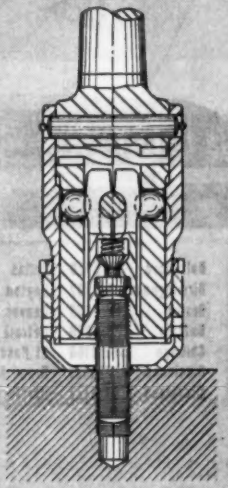
Tool brought to position over stud, about to begin drive.



Start of the drive, with tool engaged on the stud.



Drive completed, with clutch released.



Write for detailed information on the Modern Stud Setter. You will be interested in how and why it provides a proved means for stepping up your production.

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

80,000 DIFFERENT DIMENSIONS *Possible with this 37-Piece*

DoALL GAGE BLOCK UTILITY SET

● Here it is—a very practical, super-accurate set that gives tool makers and small shops everywhere the same standard of measurements and inspection used in production of precision war instruments, parts and tools.

Just the right set for large plants, too, where each inspector requires a gage block set.

9 blocks	.0001" series	5 blocks	.100" series
9 blocks	.001" series	3 blocks	1.000" series
9 blocks	.010" series	2 wear blocks	.050"

All in a neat, wood, pocket-size case.

VALUABLE BOOK ON INSPECTION *FREE*

Quality Control, the most complete and instructive book on the whole gage block subject. Gives scientific and useful engineering data and measurement tables. Write for free copy.

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WITH THE SAME SEGMENT SPECIFICATIONS MONTH AFTER MONTH

"Fractional Grading"... the exclusive Bay State feature that makes it *easier* for you to select the Bay State Segment Specifications that will remove the right amount of metal in the least time at the lowest abrasive cost . . . also assures you that those specifications will be *more closely duplicated* on repeat orders.

That's because only Bay State Segments are made in *three degrees of hardness within each usual grade.*

Such precise control of hardness is achieved by manufacturing processes that also control porosity and give bonds extra holding power.

WHEN TO SPECIFY KOOLPORE

On surface grinding jobs that can use segments with extra wide open pores, you'll find Bay State's KOOLPORE processed segments give you faster, cooler cutting... more efficient production.

For more facts about the ability of Bay State Segments to give *top performance consistently duplicated,* write for literature... today.

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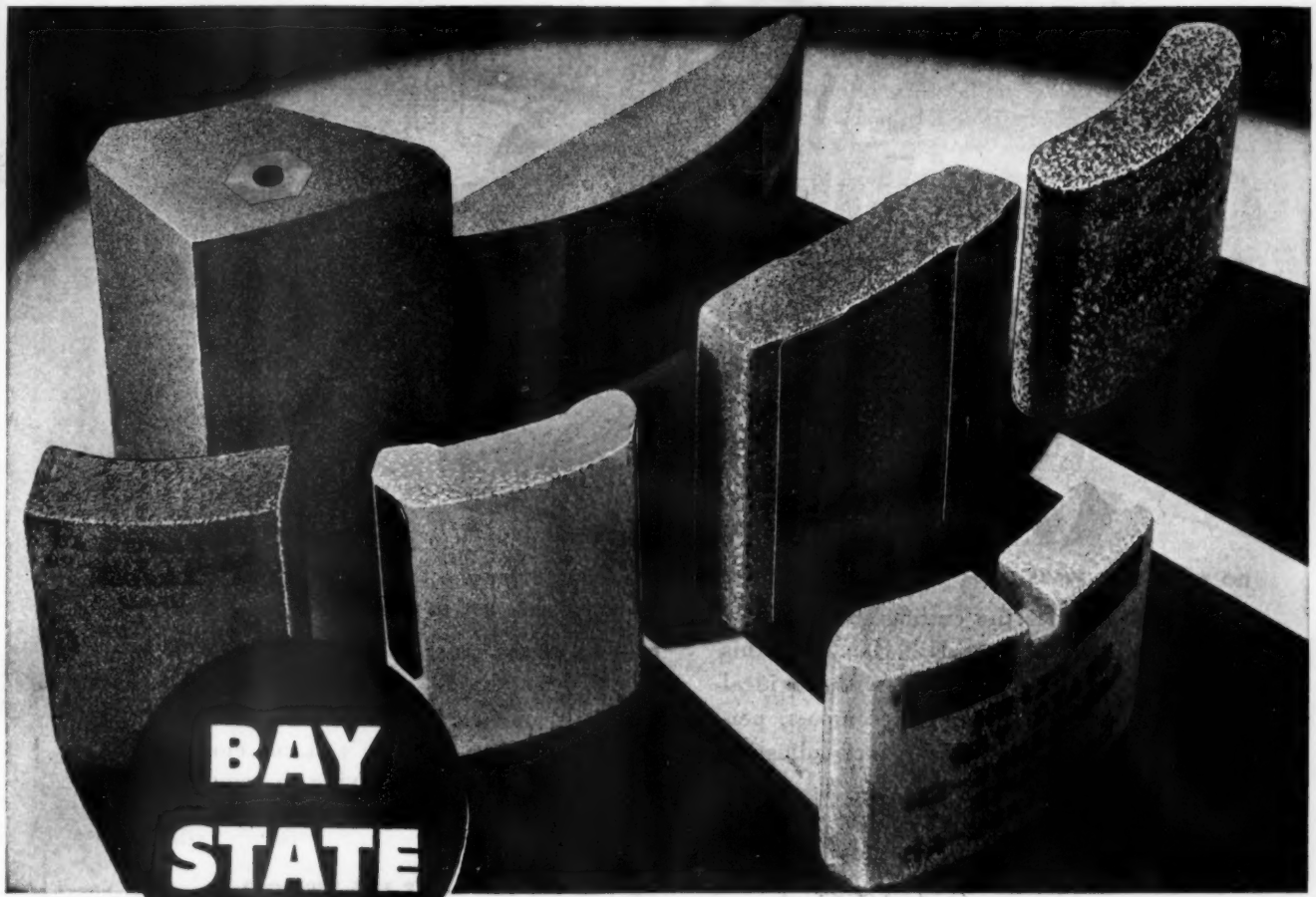

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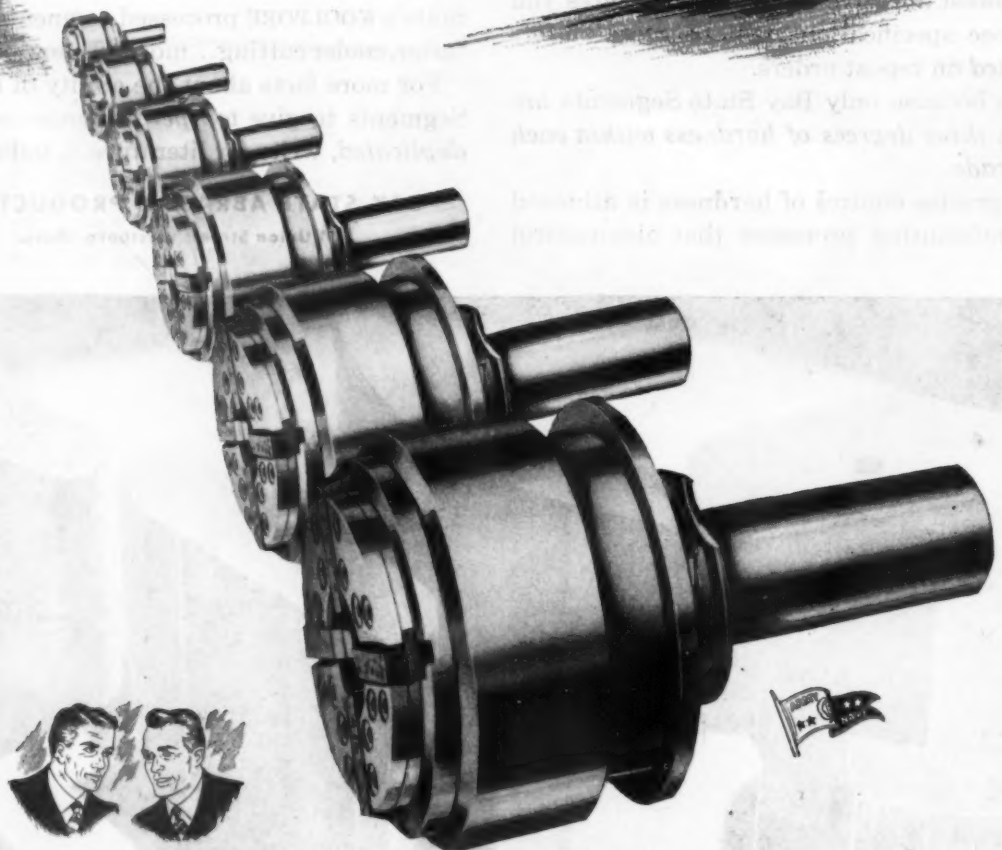
IT'S SO *Simple* TO CUT GOOD THREADS WITH A *Geometric Rotary Die Head!*



DO YOU CUT THREADS FROM 1/16" TO 3 1/4" DIAMETER?

That is the cutting size range of Geometric Rotary Die Heads. In this range, they provide you with an ideal threading tool — simple, compact, perfectly balanced. No awkward adjusting screws or stop levers.

WHAT TYPE OF MACHINE DO YOU USE?

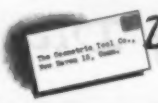
If you use a live spindle machine (especially a multiple spindle automatic screw machine) you will find that Geometric Rotary Die Heads will give precise performance, are easy to use and the chasers easy to re-sharpen.

DO YOU THREAD CLOSE TO SHOULDERS?

If so, please note how the chasers of Geometric Die Heads protrude through face plates so they can cut close to a shoulder without having to remove the face plates or making projection chasers necessary.

DO YOU CUT COARSE OR FINE THREADS?

There is a Geometric Rotary Die Head (Style KD) for the coarser pitches, and one (Style CK) for the finer pitches.



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The GEOMETRIC TOOL COMPANY
New Haven 15 Connecticut

A DIVISION OF THE GREENFIELD TAP and DIE CORPORATION

"GREENFIELD MAN" SHOWS HOW GOOD GAGING CAN PRODUCE BETTER THREADING RESULTS

[A GTD SHOW-HOW REPORT]

1 While making a routine tap service call on the "X" Company, a "Greenfield Man" noted that rejects of threaded parts seemed far above normal. Checking further, he found that these parts were gaged only once . . . at final inspection. The gages themselves were "pick-ups" of various makes.

2 The "Greenfield Man" asked permission to call in another "Greenfield Man" who was a specialist in quality control. The customer readily agreed. This "Greenfield" engineer made a thorough study and report on the plant's threading operations from a gaging point of view.

3 The "Greenfield" experts' recommendations were accepted and a complete gaging system installed. Gages were provided for checking size at each key point in the production cycle of the part. Equipment was purchased for checking the gages themselves, and an accounting system installed that insured gages in working condition being ready for every job when needed.

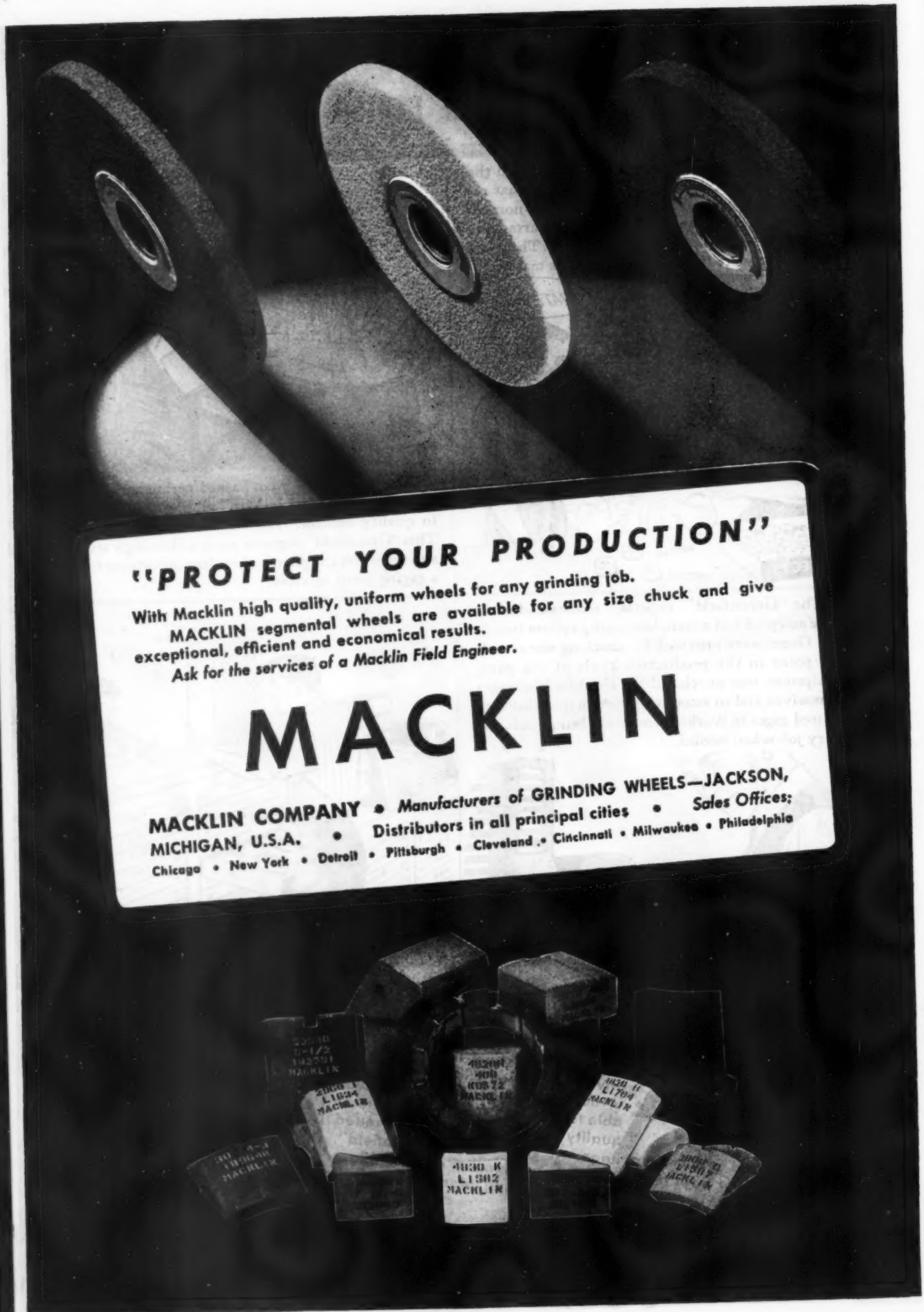
4 Finally at "Greenfield's" suggestion, modern methods for storing, protecting and distributing gages were adopted.

Results!

Through the "know-how" and initiative of a "Greenfield Man" making a routine service call, this firm was able to obtain a complete system of quality control that cut costs, speeded production and reduced spoilage. It shows how "Greenfield", leading maker of both threading tools and gages, can provide a DOUBLE-BARRELLED service to metal-working plants through its country-wide staff of field engineers.

ON THREADING PROBLEMS SIMPLY CALL YOUR "GREENFIELD MAN" THROUGH YOUR "GREENFIELD" DISTRIBUTOR!

GREENFIELD TAP and DIE CORPORATION
GREENFIELD · MASSACHUSETTS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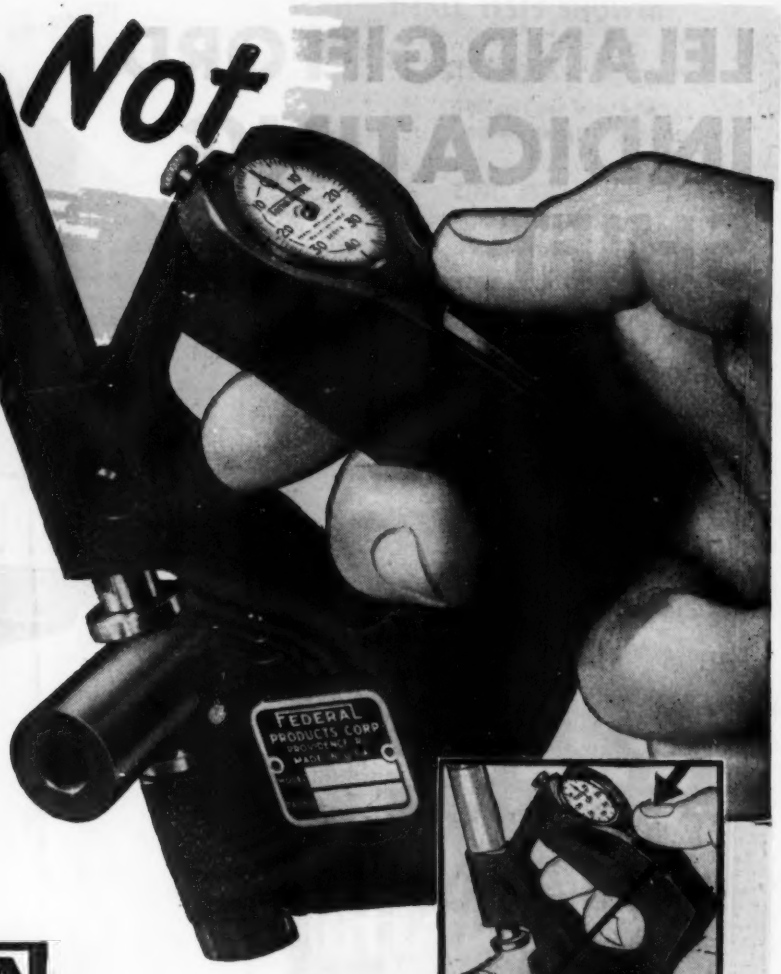
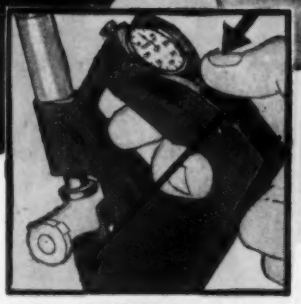
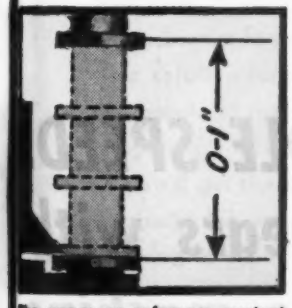
Why Not SEE Rather than feel



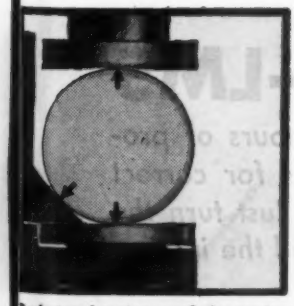
Weight of Gage and operator's hand rests upon the fixed contact. Gage is only ⅝" wide.



A light thumb pressure retracts the sensitive contact. Work surface is not marred. The contact movement is transferred direct to Indicator.



The upper or reference contact is adjustable to any dimension within one inch.



Backstop locates work in center of contacts and is adjustable for size.

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INDICATOR SNAP GAGE *with-Retractable Anvil Adjustable for Size No Lost Motion*

This Model 1330 P-100 Visual Dial Indicator Snap Gage marks a decided step ahead in gaging practice. Conventional type, fixed or solid snap gages depend upon "feeling", and personal variations in the sense of touch influence the inspection accuracy. But, you **see** with this.

The Model 1330 P-100 has other advantages too — **The retractable anvil** makes it easier to apply, and it eliminates all excuses for marring the surface of highly finished workpieces. **It is easily adjusted** to any dimension within one inch and locked in place. **There is no lost motion.** The movement of the sensitive contact is transferred directly without error to the Dial Indicator. **The weight of the Gage and the inspector's hand rests upon the fixed or reference contact. It is thin:** only ⅝". It is small; not over 6" at the longest point. It is light; weighs only 15 ozs. It reads in tenths (.0001"). Contacts are hard wearing Norbide (Made by Norton Co.) For more details concerning this modern snap gage write

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CADMIUM BALLS 2" diam.
17 cuts per min. with
4-pitch DoALL Buttress

COPPER COILS 1½" diam.
[illegible] cuts per min. with
3-pitch DoALL Precision

DoALL TESTS SHOWED:

CAST PHOSPHOR BRONZE 3/8" thick
50.8 in. per min. with
4-pitch DoALL Buttress

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200 cuts per min. with
10-pitch DoALL Precision

MEEHANITE 4" diam.
3 sq. in. per min. with
6-pitch DoALL Precision

DoALL TESTS SHOWED:

STEEL BEAM 1/8 x 2½"
100 cuts per min. with
10-pitch DoALL Precision

ZINC 1" thick
38 lin. ft. per min. with
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BRASS ALLOY
[illegible] sq. in. per min. with
[illegible]-pitch DoALL Buttress

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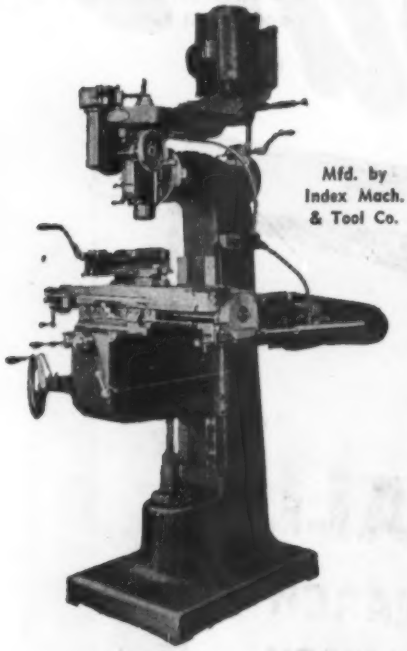

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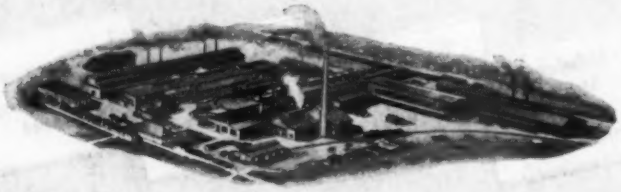

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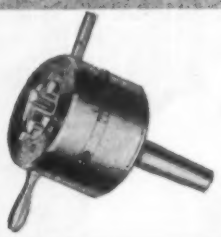

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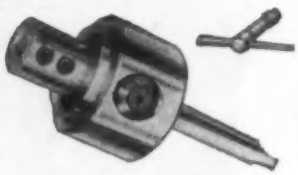
Reset automatically or manually with ¼ turn of handles—opens by pull-off method—stationary, the work revolves.



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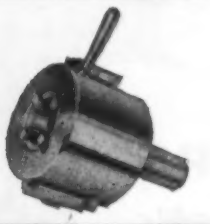

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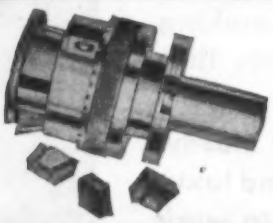

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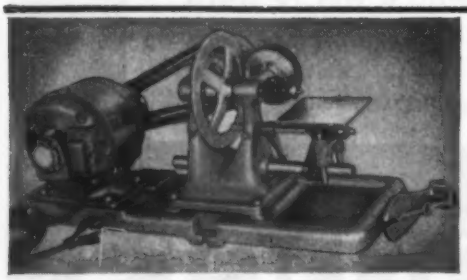

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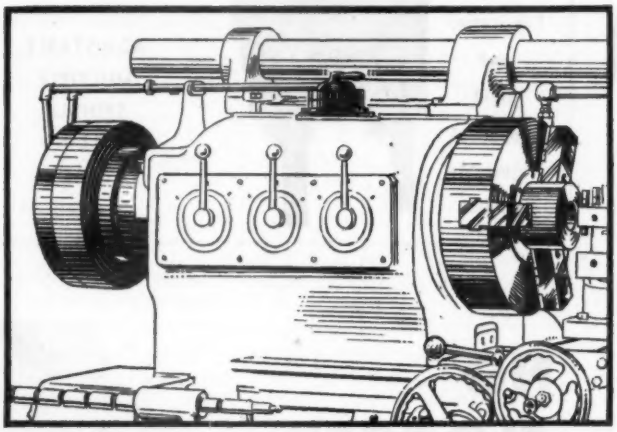
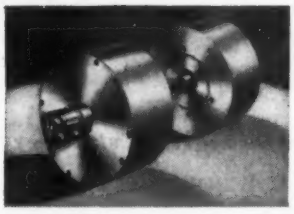
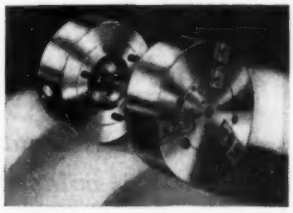


SERIES 2100



Double acting rotating air cylinder for fast operation of power chucks and special headstock fixtures.

SERIES 1300



Self-Centering power chuck with three non-adjusting jaws and forged steel body.

Modern production calls for fast accurate machining, *plus* the elimination of as much idle time as possible. That's where Skinner Power Chucks can help you.

On turret and engine lathes and automatic machines where long runs and repetitive operations are performed, the chucking time may be an appreciable part of the total operation time. Skinner Power Chucks are designed to grip fast, hold tight, and release fast — all by means of a single operating lever. This means a minimum of chucking time and a minimum of operator fatigue.

Skinner power chucking equipment includes a complete line of self-centering, non-adjustable and combination adjustable chucks, air cylinders, operating valves, gauges, filters, etc. — all are designed for long life and trouble-free service. Write for Catalog No. *57* which gives complete details and specifications on all Skinner products.

THE SKINNER CHUCK COMPANY SKINNER CHUCKS **343 CHURCH ST., NEW BRITAIN, CONN.**

HAND & POWER OPERATED MACHINE CHUCKS—AIR CHUCK EQUIPMENT—FACE PLATE JAWS—MACHINE VISES

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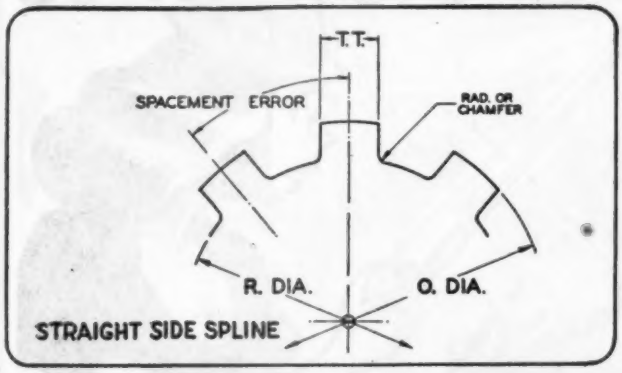
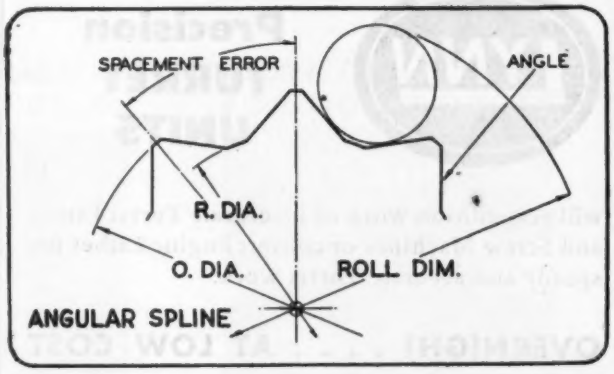


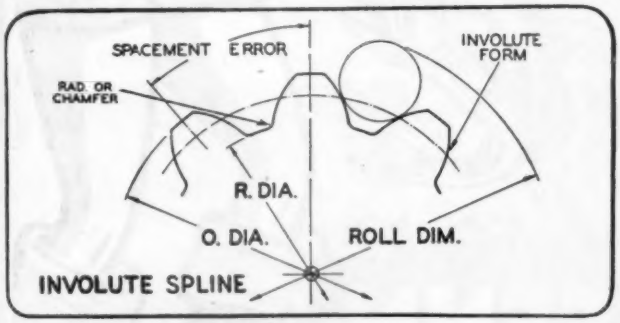
STRAIGHT SIDE SPLINE

	1" dia.	2" dia.	3" dia.
T. T.	±.0001	±.0002	±.00025
RAD. OR CHAMFER	±.002	±.002	±.002
R. DIA.	+.0 −.002	+.0 −.0025	+.0 −.005
O. DIA.	±.0001	±.00015	±.00015
SPACEMENT ERROR tooth to tooth or cumulative	±.00015	±.0002	±.00025



ANGULAR SPLINE

	1" dia.	2" dia.	3" dia.
ROLL DIM.	±.00025	±.00025	±.00025
ANGLE	±2′	±3′	±5′
R. DIA.	+.0 −.002	+.0 −.0025	+.0 −.005
O. DIA.	±.0001	±.00015	±.00015
SPACEMENT ERROR tooth to tooth or cumulative	±.00015	±.0002	±.00025



INVOLUTE SPLINE

	1" dia.	2" dia.	3" dia.
ROLL DIM.	±.0001	±.00015	±.0002
RAD. OR CHAMFER	±.002	±.002	±.002
INVOLUTE FORM	±.0001	±.00015	±.0002
R. DIA.	+.0 −.002	+.0 −.0025	+.0 −.005
O. DIA.	±.0001	±.00015	±.00015
SPACEMENT ERROR tooth to tooth or cumulative	±.00015	±.0002	±.00025

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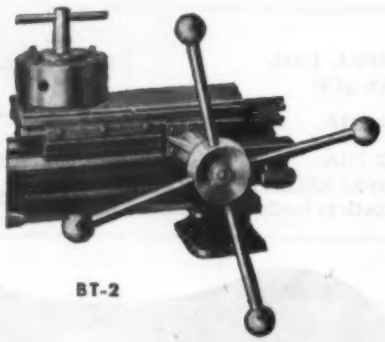

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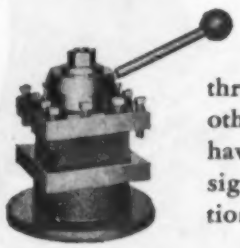

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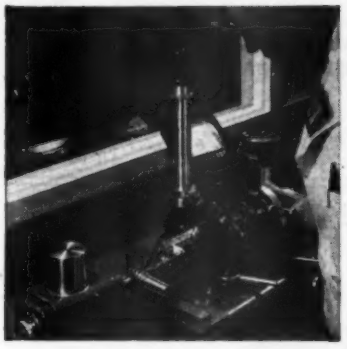

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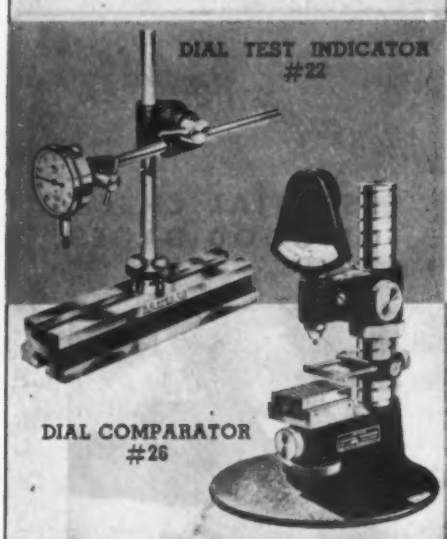
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DIAL COMPARATOR
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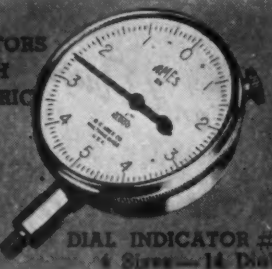
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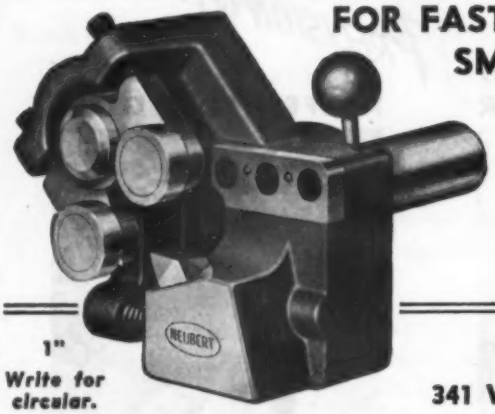

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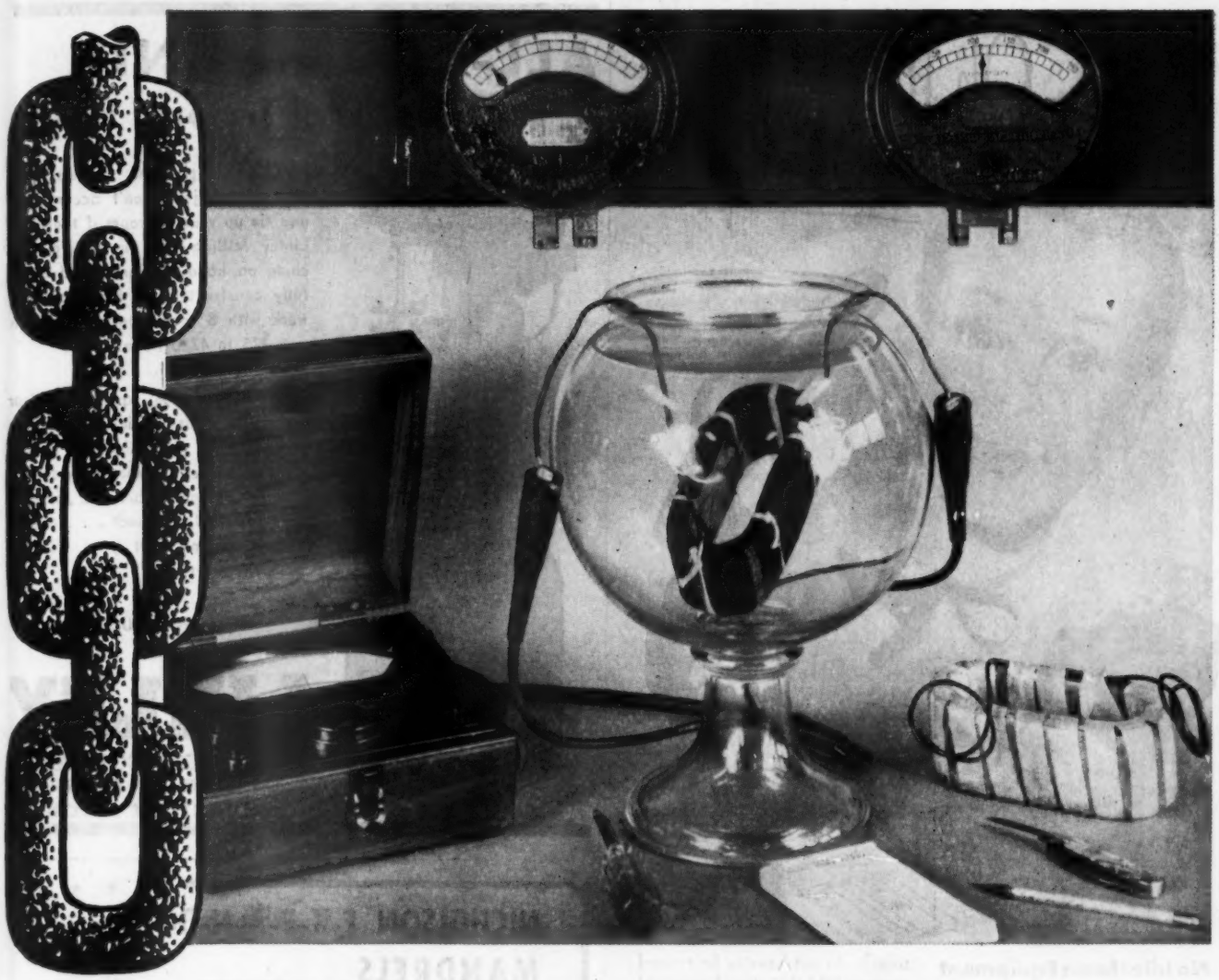

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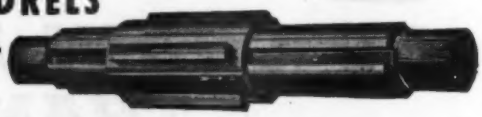

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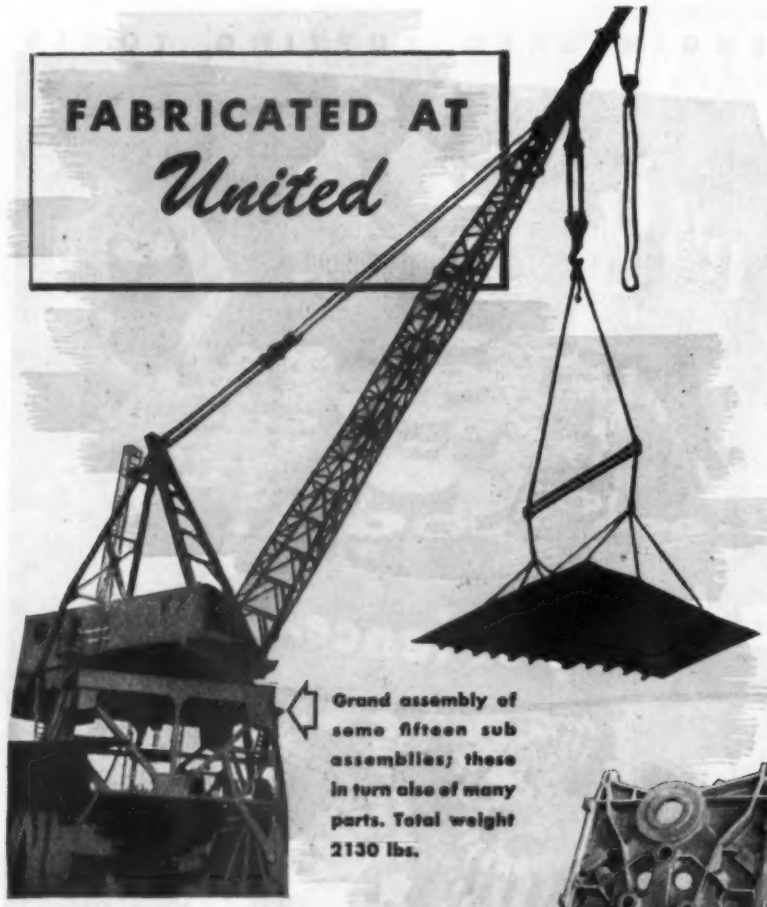
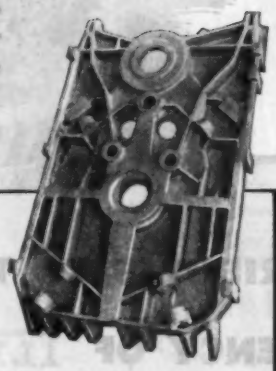
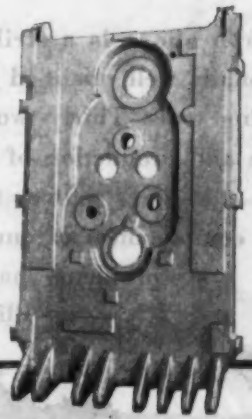


Grand assembly of some fifteen sub assemblies; these in turn also of many parts. Total weight 2130 lbs.



BACK VIEW



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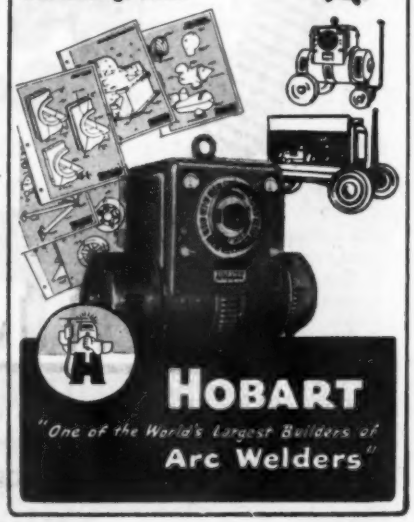

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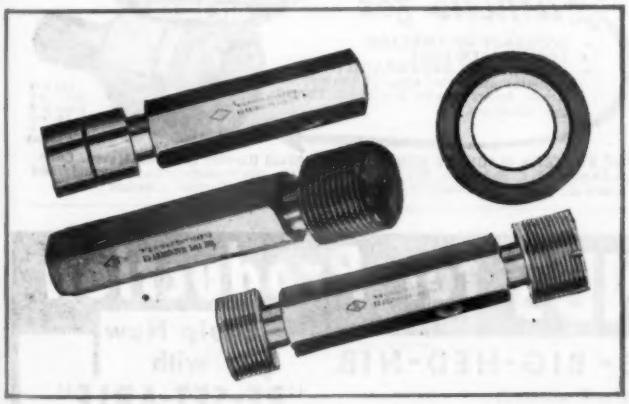

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No. 24 CN RE-SET-ABLES are now selling in 100 lots. Ask for easy No. 4 Catalog and Grinder's Instruction Card. Shows sizes to fit your machines. Tools backed by service unequalled.

All diamonds are LOC-KEY-SET for immediate shipment . . . Tools numbered in units of ⅛ carat (No. 1 size) and lettered to denote quality of diamond and style of mounting . . . 3 grades — Common (C), Medium (M), Select (S). (24-hour resetting service $1.00 postpaid.) Bigger stones in C grade are genuine economy in diamond use. For large wheels we recommend No. 60-CN.

Equip Now with "RE-SET-ABLE" Diamond Tools on Your Precision Grinding Production Line

DIAMOND TOOL COMPANY, Not Inc. SHELDON M. BOOTH, Pres. 938 E. 41st Street CHICAGO 15, Ill.

TANTUNG
Non-ferrous Cast Alloy Cutting Tools
– with high red hardness and strength for those difficult "in-between" jobs.
40 50 60 70 80 90 100 110 120 140 160 180 200 250 300 350 400 450 500 600
HIGH-SPEED STEEL RANGE
SURFACE FEET PER MINUTE
TANTUNG RANGE
VASCOLOY-RAMET CARBIDE RANGE

CHOOSE YOUR TOOLS
simply and scientifically

UP TO 90 SURFACE FEET PER MINUTE, High Speed Steel Tools are best, BUT at higher speeds they require frequent grinding, valuable time is lost, production suffers.

BETWEEN 90 and 190 SURFACE FEET PER MINUTE, *TANTUNG IS IDEAL.* Tantung operates at higher speeds, will take heavier cuts and feeds. It produces more pieces per grind than high speed steel and will do it in substantially less time. Performance records consistently show six times tool life and trebled production. Tantung cuts any material that can be machined. Write for catalog of full line of Tantung Cast Alloy Cutting Tools.

FOR HIGHER SPEEDS, use Vascoloy-Ramet Tantalum/Tungsten Carbide Tools, by every comparison the world's finest carbide.

FREE SURFACE SPEED TABLE AND TOOL SELECTOR **CHARTS**

in Wall size and Pocket size. **THESE CHARTS** show at a glance — table of speeds, feeds and proper tool selection, whether you use high speed steel, TANTUNG, or cemented carbide.

The Vascoloy-Ramet standard of quality is reflected in lower overall machining costs when you use Tantung or Tantalum/Tungsten Carbide Tools.

4527

VASCOLOY RAMET CORPORATION

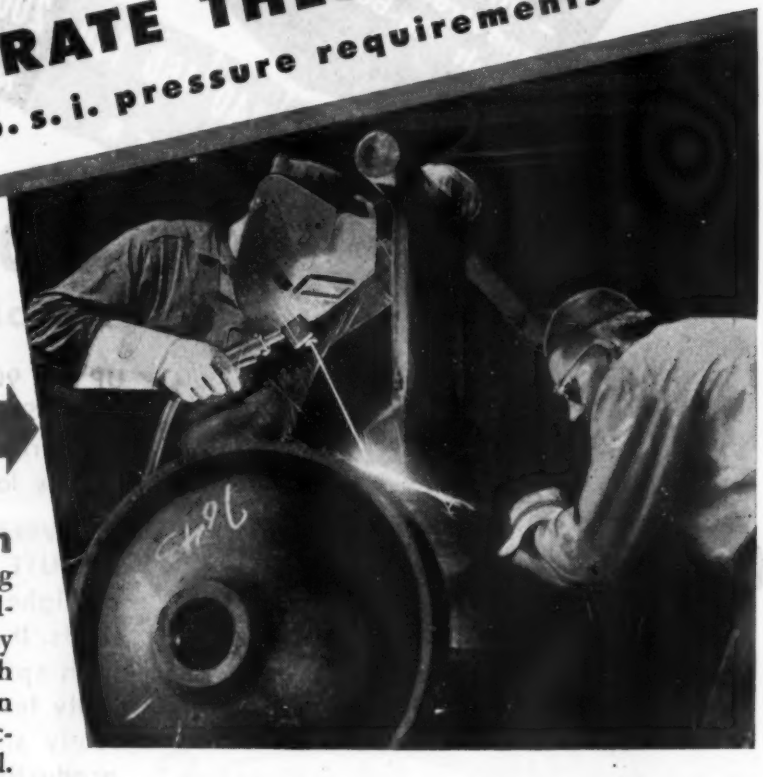
NORTH CHICAGO, ILLINOIS • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

1919

Butt welding steel couplings for oil casing, a method developed by A. O. Smith that utilized SMITHway patented paper-coated electrodes and produced welds with tensile strengths at a new high of approximately 60,000 p.s.i.

26 YEARS SEPARATE THESE PICTURES

. . . and 70,000 p. s. i. pressure requirements



1945

X-ray quality welding of high-tensile, alloy steel torpedo air flasks, with special electrodes developed by A. O. Smith—an achievement that produces welds with tensile strengths in excess of 130,000 p.s.i. after heat treatment.

The Proof Is in Production

The mastery of preparation and welding techniques that made A. O. Smith developments as revolutionary in 1919 as they are in 1945 is born of welding research that never ends . . . research that goes on in A. O. Smith laboratories and production research in A. O. Smith plants as well.

Every day more than 320,000 SMITHway electrodes are used on every type of product—large and small complex and simple, mild steel, high-tensile, and stainless.

For detailed specifications of SMITHway Certified Electrodes and their application to specific welding jobs, send for the SMITHway Welding Guide.

Mild Steel . . . High Tensile . . . Stainless Steel

WELDING ELECTRODES

made by welders . . . for welders

A Complete Line Soon SMITHway A. C. Welders

Ready for delivery soon, the expanded line of A. C. Welders includes three new models of 150-, 200-, and 250-ampere capacity, in addition to the 300-, 400-, and 500-ampere heavy-duty models. Write for complete specifications and prices.

SMITHway Certified WELDING ELECTRODES

A. O. SMITH Corporation

NEW YORK 17 • PITTSBURGH 19 • CHICAGO 4 • TULSA 3
HOUSTON 2 • DALLAS 1 • LOS ANGELES 14 • SEATTLE 1

INTERNATIONAL DIVISION: MILWAUKEE 1, WIS. • In Canada: JOHN INGLIS CO., LIMITED

HOW A DISSTONEER SOLVED THE CASE OF MANPOWER SHORTAGE IN TIMBER CUTTING

FEW industries have faced a manpower shortage greater than that of the timberman. Yet despite this handicap, greatly increased production was demanded. The application of new methods or the use of new equipment seemed the only answer.

A Disstoneer* had been called in by Army engineers and given the problem of developing a mechanical saw for military use. The solution was found in the Disston Chain Saw with Mercury Gasoline Engine. Today, thousands of the same time and cost saving saws are used in our forests, in our mines and in many industries.

Operations have been carefully watched and studied. During the same time, additional research was carried on in the Disston laboratories. And now Disston is ready to announce *The New "G-AY" Model Disston Chain Saw,* one of the finest cutting tools Disston ever made.

Though unchanged in principle, this new saw has many improvements: added power and important new features . . . faster, steadier running . . . increased ease and economy of operation . . . greater sturdiness . . . easy to operate . . . etc.

Another clear-cut case of Disston leadership

*DISSTONEER—a man who combines the experience of Disston leadership and sound engineering knowledge to find the right tool for you—to cut wood, to cut metal and other materials—and TO CUT YOUR COST OF PRODUCTION—*not only on special work, but on ordinary jobs as well.*

OUTSTANDING FEATURES OF NEW "G-AY" MODEL

Air Cleaner to keep sawdust and dirt from engine and carburetor.

Fuel Filter (built in gasoline tank).

Die cast cooling fan.

Die cast cylinder, with increased number of fins, providing greater cooling area.

Reduction gear ratio of 3:1—Provides more efficient chain operating speed.

Positive multiple disc clutch, 13 plates.

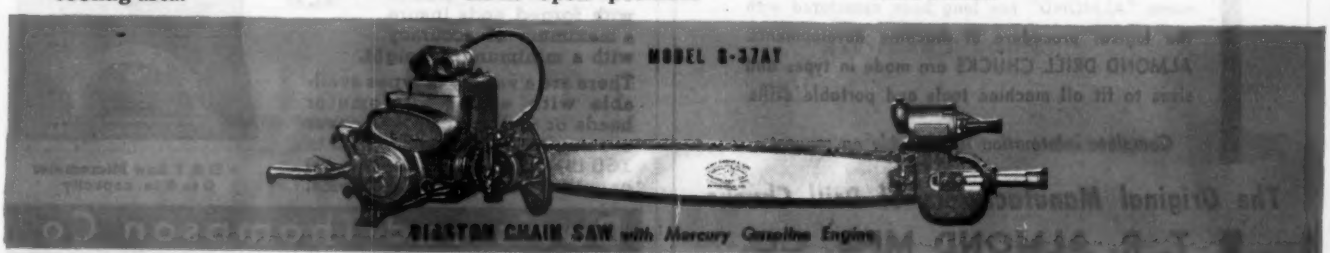
Conveniently located throttle may be set in "open" position.

Muffler prevents exhaust from annoying operator.

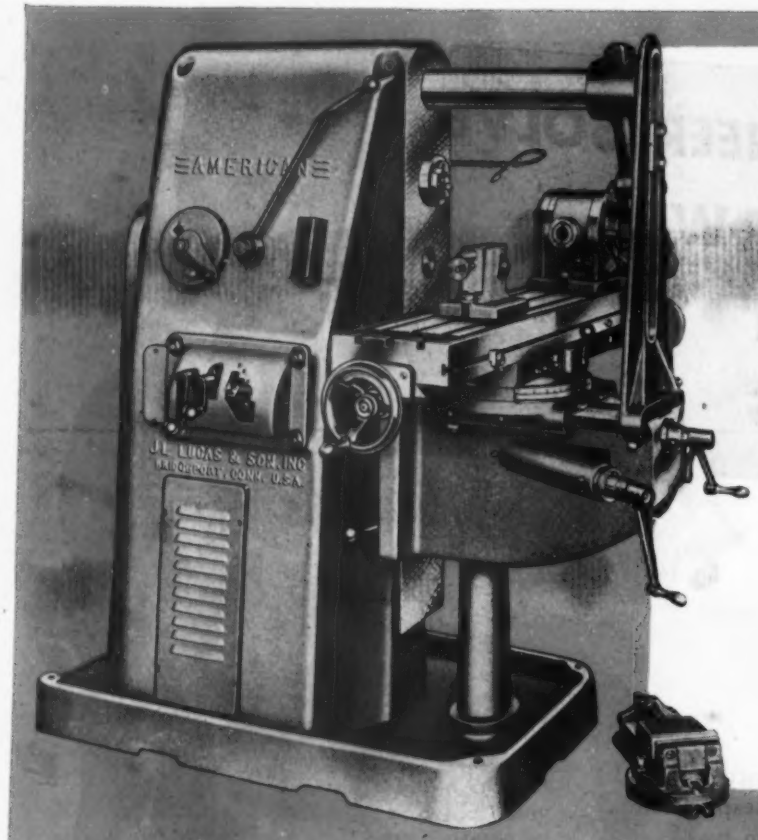
Equipped with "L" pattern chains.

Equipped with 3-rib protection cradle underneath engine.

And others.



HENRY DISSTON & SONS, INC., 920 Tacony, Philadelphia 35, Pa., U. S. A.



EXPLORE THE POSSIBILITIES of the No. 2 AMERICAN PLAIN and UNIVERSAL MILLING MACHINE ON YOUR WORK

Offering infinite spindle speeds—Motor in base drive—Standardized spindle nose—heavy rugged construction—versatility for a wide range of work.

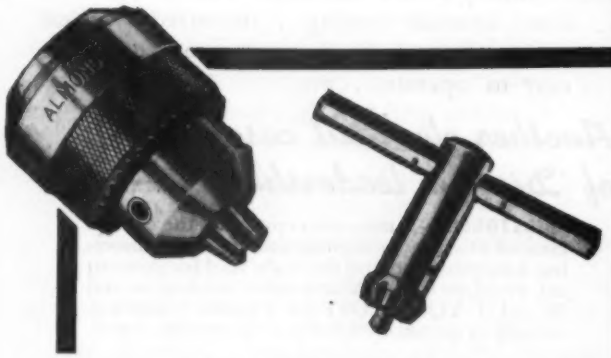
The following specifications apply to both Plain and Universal Types

TABLE—Working Surface—46"x10½"
T-slots—3-11/16"
RANGE—Longitudinal Power Feed—25"
Transverse Power Feed—9"
Vertical Hand Feed—17"
Max. Distance spindle to table—17"
SPINDLE—Standardized Flanged Nose—No. 40 Taper
Hole through spindle—21/32" dia.
Length Front Bearing—5"
Speeds—Infinite—Range 25-500 RPM
FEEDS—16
OVERARM—Dist. to center of Arbor—6½"
FLOOR SPACE—85"x68"

Prompt Deliveries Now Available

J. L. LUCAS & SON, Inc.
BRIDGEPORT, CONN.

Send for Illustrated literature—



Almond Drill Chuck

THE FIRST IN THE FIELD

ALMOND THREE-JAW DRILL CHUCKS were the first to be placed on the market over Seventy years ago. As Pioneers in the field of Drill Chucks, the name "ALMOND" has long been associated with the logical procedure of machine developments. ALMOND DRILL CHUCKS are made in types and sizes to fit all machine tools and portable drills.

Complete information is available on request.

The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.
Ashburnham, Mass., U.S.A.

SMITH & MILLS
CRANK SHAPERS

sizes 12" to 32" stroke

THE SMITH & MILLS CO. **Cincinnati, Ohio**

LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades

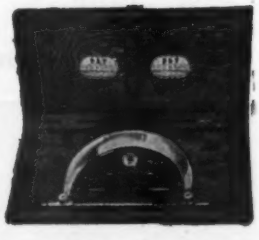
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

D&T MICROMETERS AND SNAP GAGES

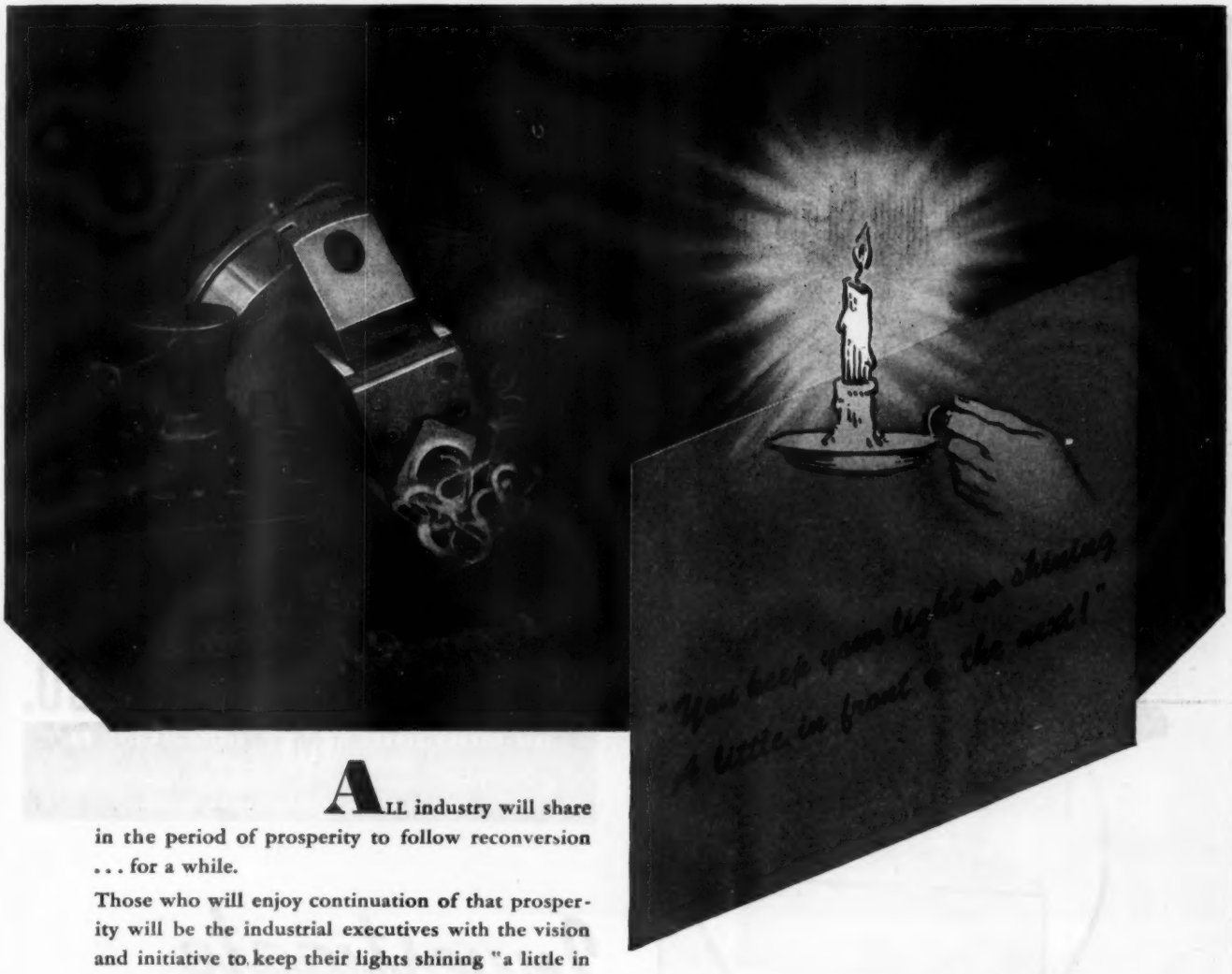
Tubular welded frames with forged ends insure a maximum of accuracy with a minimum of weight.

There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . *Write for Bulletin 200* or outline your gaging problems.



• D & T Bow Micrometer 0 to 6 in. capacity

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin



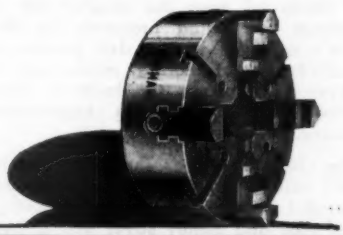
ALL industry will share in the period of prosperity to follow reconversion . . . for a while.

Those who will enjoy continuation of that prosperity will be the industrial executives with the vision and initiative to keep their lights shining "a little in front o' the next".

These executives are planning — *now* — the policies and the production equipment that will assure success and growth through many post-war years.

THE TIME TO PLAN RETOOLING IS . . . NOW!

Work-holding equipment can be a source of even higher efficiency in the production of your new peace-time product. Valuable time can be saved by studying, now, the problems involved in machining these new products.



Some of your chucks may have had to give as much service, during these last three years, as would normally have been spread over five or six. Many of them probably need replacement if your plant is to be ready for its post-war load.

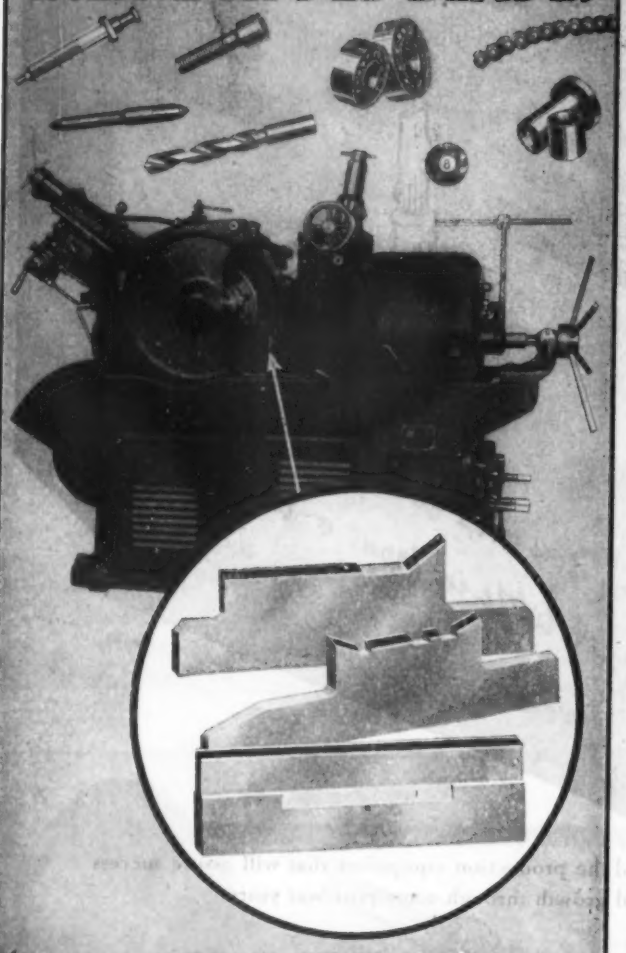
Our engineering department has a tremendous fund of experience which is at your disposal. Consult us on any work-holding problem.

THE CUSHMAN CHUCK CO.
HARTFORD 1, CONN.

CUSHMAN CHUCKS

A WORLD STANDARD FOR PRECISION

CENTERLESS GROUND *with* TALIDE-TIPPED BLADES



Talide-Tipped Blades, with Tungsten Carbide wear strips, have become standard equipment for centerless grinding armor-piercing shot, shells, projectiles, bullet cores, aircraft parts and other ordnance material

The extra long life of super-hard Talide Blades, plus their natural ability to resist scoring and galling, have helped to increase the production of precision ground parts by eliminating down-time and rejects.

In the post-war period, Talide-Tipped Blades will be used to increase the production of lower cost roller bearings, fountain pens, cap screws, twist drills, bushings and a wide variety of shafts, spindles and screw machine products. Write for catalog 43-WP listing full particulars and prices.

TIPPED WITH TUNGSTEN CARBIDE

METAL CARBIDES CORPORATION · TALIDE · YOUNGSTOWN, OHIO

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO

TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

MARKING MACHINES

STEEL DIES—TYPE AND FIXTURES

Matthews marking machines, dies, type and fixtures supplied for marking names, codes, trade names, trade marks, patent numbers, etc., on all types of industrial parts or products.

Write for literature

Flat Die for Marking Round Parts

Round Die for Marking Flat Parts

Roller Die with Interchangeable Type

No. 334 Marking Machine

JAS. H. MATTHEWS & CO.

3936 FORBES STREET · PITTSBURGH 13, PA.

BRANCH: NEW YORK, BOSTON, CHICAGO. PLANTS: PHILADELPHIA, NEWARK, SYRACUSE

District Sales Offices: Cleveland, Hartford, Birmingham

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 15

NATIONAL MACHINE TOOL CO.

CINCINNATI, OHIO

Big, Tough Jobs

WILLIAMS "SUPERECTOR"

● This rugged, reversible ratchet wrench is designed for speed and power. Quadruple pawls, rather than a single pawl, combine with a drop-forged handle to give it unbelievable strength. Twenty teeth on all sockets—both hex and square—permit complete rotation of nuts with only 18° handle swing. Made in five brawny sizes up to 53" long, accommodating sockets with openings from 1" to 4-5/8". Sold by Industrial Distributors everywhere. J. H. Williams & Co., Buffalo 7, N. Y.

WILLIAMS
DROP-FORGINGS AND DROP-FORGED TOOLS

Reconversion is the No. 1 topic of the day. Attention is being turned to the production of civilian goods to meet demands long held up by the requirements of war.

Reconversion is a big job . . . one that cannot be accomplished in one day or two. Inventories have to be taken . . . production-lines revamped . . . plants re-tooled . . . new machinery installed.

And while all this is going on, it's a good idea to clean-up shop . . . to get rid of ancient oil-and-grease deposits...to make factory and warehouse space spick-and-span for the job ahead.

For this cleaning-job, SPEEDI-DRI, the oil-thirsty absorbent, is the answer. A white granular material, SPEEDI-DRI soaks-up oil and grease deposits like a blotter soaking-up ink. Even when these deposits have accumulated over the war-years, SPEEDI-DRI in time will make the floors clean and bright.

And the beauty of it . . . SPEEDI-DRI does not disturb shop-routine. It works . . . while *you* work in safety. Just spread it over offending surfaces . . . and you've got a Magic Carpet underfoot. Sweep it up . . . and floors are home-clean!

No expensive machinery is needed to apply SPEEDI-DRI . . . no trained personnel. SPEEDI-DRI works equally well on all types of floors . . . composition, cement, or wood.

Attach your card to this advertisement and mail for the full story of SPEEDI-DRI, and a free, generous sample.

SUPPLIERS:

East — Safety & Maintenance Co., Inc., New York 1, N. Y.
South, Midwest & West Coast —
Waverly Petroleum Products Co., Philadelphia 6, Pa.

SPEEDI-DRI
OIL AND GREASE ABSORBENT

UL

"These drivers on the H.P. Rotor absolutely did away with all vibrations and smoothed out all cuts. We then changed to the Cruiser Rotor and used a 1" square nose tool without any trouble, something we cannot do with the solid drive. I believe a lot of tool breakage will be avoided." . . . memo from one of America's largest manufacturers, name on request.

Drafto Vibra-Drive interposes an absorbent cushion, takes up tool and gear train vibrations. Five sizes for swings up to 72". For all work held between centers on lathe or grinders. Write, wire or phone for full information.

GREENLEAF CORPORATION

Dept. AM. **Wilkinsburg, Pittsburgh 21, Pa.**

Lead Hammer with "Shur-Grip" Handle in use at Reynolds Machinery Company, Ship Street Rebuilding Plant, Providence, Rhode Island.

***Johnson* "SHUR-GRIP" Lead Hammer!**

Day in, day out, there are countless jobs that call for a lead hammer. To save precious man hours, many times lost through costly hammer slips, equip your shop or plant thoroughly with SAFE Johnson "Shur-Grip" hammers. "SHUR-GRIP" handles give user a "bulldog" grip and are almost indestructible.

"SHUR-GRIP" handles used only with Johnson 3, 4, 5 and 6 lb. lead hammers. For illustrated folder and price list, write Dept. A.M.

JOHNSON TOOL COMPANY

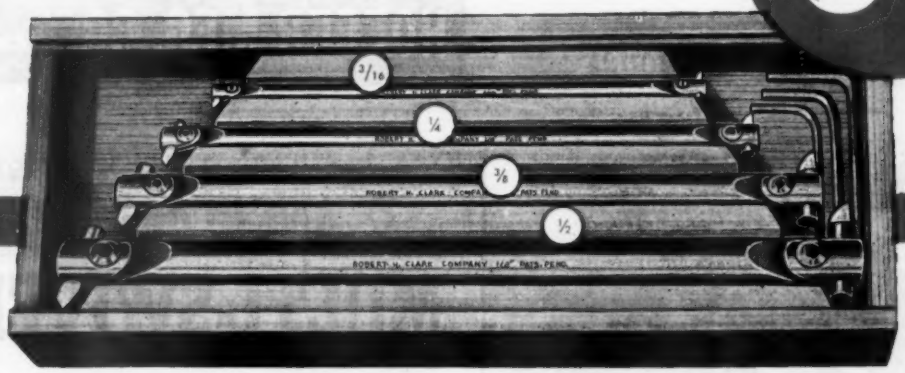
LAWRENCE H. COOK, OWNER
PLASTIC MOLDS—TOOLS
52 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

WOW What a Value!

Complete Set of 4 Clark LEVER-LOCK BORING BARS

WITH PRECISION GROUND REPLACEABLE BITS

Now only **$8.70** Packed in wood box



That's right—4 precision boring bars, each with the exclusive Clark Lever-Lock principle that holds tool bits at extreme end, 4 replaceable precision ground thread tool bits, and 4 boring bits — all packed in sturdy wood box — and all for only $8.70.

Remember, only Clark Lever-Lock Boring Bars give you small sizes down to ⅜" O. D. They have no interfering set screws or bolts, and can bore or thread to bottom of blind hole with full clearance. 15° holding channel in one end, right angle channel in other.

Don't delay — mail the coupon today!

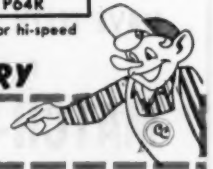
SPECIFICATIONS

Dimensions of Boring Bars		Size of Cutters Round	Can be used with Clark Tool Holders Nos.
Diam.	Lgth.		
3/16	5	3/32	P60R, P61R
1/4	6	1/8	P60R, P61R, P62R
3/8	7	3/16	P61R, P62R, P64R
1/2	8	1/4	P62R, P64R

Extra bits, ground or unground, carbide or hi-speed steel available from stock.

Clark Lever-Lock Bars are held rigidly in standard Clark Parallel Channel Tool Holders without use of adapters

The exclusive Clark Lever-Lock securely grips the tool bit at extreme end of bar.



IMMEDIATE DELIVERY

ORDER COUPON

Send No Money

ROBERT H. CLARK COMPANY Dept. AM
9330 Santa Monica Blvd., Beverly Hills, California

Please have your distributor of Clark Cutters send me ___ complete sets of Clark Lever-Lock Boring Bars. Each set consists of 4 Lever-Lock Boring Bars, 4 precision ground thread tool bits, and 4 boring bits, packed in sturdy wood box, for only $8.70.

Name_____

Address_____

City_____ State_____

Write for Clark Cutter Catalog of Adjustable Tool Holders

CLARK CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD • BEVERLY HILLS CALIFORNIA

ADAPTABILITY.. HOEFER MULTIPLE SPINDLE HEADS

OFFER MANY PRODUCTION COMBINATIONS FOR INCREASING OUTPUT

GUARDS REMOVED

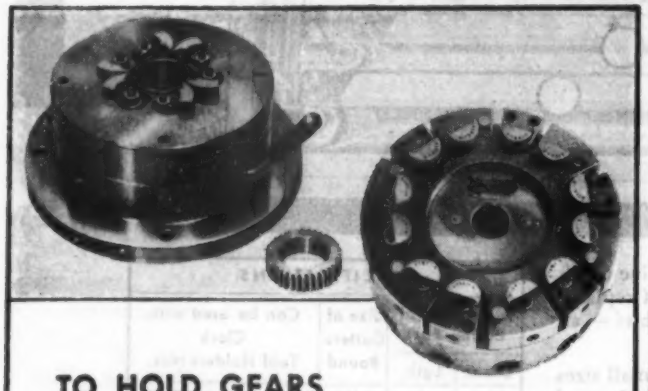
Example 1—Showing the possibilities of making a three-way high production machine using two units mounted on a base in connection with a standard heavy duty driller. The central electrical control and the regular power feed lever on the driller automatically start the feed of both units, which go through their required cycle and stop at return position. This unit drills 26 holes in three different planes in the time previously taken to drill the longest hole of the 26.

Example 2—Two-way machine consisting of 3 and 5 h.p. units driving 8 and 12 spindle universally adjustable heads. The fixture is mounted on center of machine for drilling both ends of compressor simultaneously. Machine has central electrical and central hydraulic control.

These units will more than repay your investment in the quality of work produced and in uninterrupted service. No matter what your job is we can furnish the head to meet your production need. Let one of our experienced engineers confer with you.

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*



TO HOLD GEARS
with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION

Principle used only in

MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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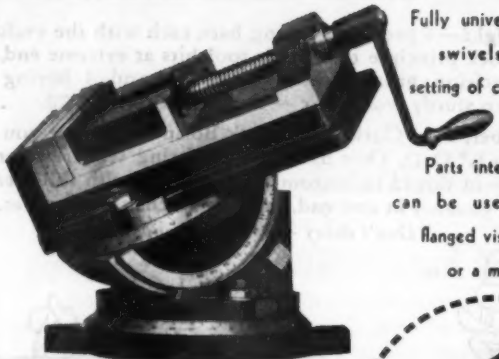
LeMaire Tool & Manufacturing Co.
2665 So. Telegraph Rd., Dearborn, Mich.

SAVE TIME ON INTRICATE

★ ANGULAR SET-UPS ★

MULTI-SWIVEL VISE



Fully universal . . . three swivels simplify the setting of compound angles.

Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or a multi-swivel vise.

The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.

NO PRIORITY NECESSARY

DISTRIBUTORS! Inquire about new exclusive franchise.

MASTER TOOL CO.
161 HIGH STREET • BOSTON, MASS.

SAYS THE MAN IN THE HELMET—

"I get nice, smooth flat fillets every time with AIRCO No. 78E...

(AWS Classification E 6010)

... "It's my favorite electrode for all-position DC reverse polarity welding of mild steel

"Look at that neat, flat fillet. Airco No. 78E gives that type of high quality, flat-faced fillet in all positions, and it's especially good on vertical and overhead.

"Its special coating and its fine spraying action speed up vertical and overhead fillet welds. Metal sets up rapidly and the arc is strong and forceful.

"There's no interference from slag and no deflection in the arc in any position. Deposit speeds are faster than most electrodes,— weld contour is always tops.

"Slag comes off easily, another good feature. That's why I say when the job calls for an AWS E6010 electrode — and when quality, speed and appearance are important — give me Airco 78E every time."

Take a tip from the Man in the Helmet and select your electrodes for their *working ease and efficiency* as well as for their metallurgical properties.

There is a complete line of Airco electrodes for every welding job. Catalog No. 120 gives full details. For a free copy write the nearest Airco office or Dept. AM at the New York address. Air Reduction, General Offices: 60 East 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.

Weld with

AIR REDUCTION

Offices in all Principal Cities

AIRCO ELECTRODES FOR BETTER WELDS AND EASIER WELDING

WHERE THE ARMS OF WAR ORIGINATE

MACHINE TOOLS form the basis for a war production program. An untold number of precision drilling operations must be performed to produce superior fighting equipment. And in the tooling for this war Sibley Drilling Machines have played an important part.

SIBLEY

MACHINE & FOUNDRY CORPORATION

SOUTH BEND 23, INDIANA

AMIC

Precision VERNIER GAGES

NOW RELEASED TO THE TRADE

AMIC PRECISION VERNIER CALIPERS

6" 10" 12" 24" Range
150mm, 250mm, 300mm, 600 mm available from stock or on short delivery.

AMIC PRECISION VERNIER HEIGHT GAGES

10" 18" 24" Range
250mm, 460mm, 600mm available from stock. Long "Open-window-type" slider cut of one solid piece of toolsteel. No rivets, no cross members.

Base and slider of Height Gages rust-proofed by attractive deep penetration—Black Magic Finish.

All hardened parts treated by high frequency process.

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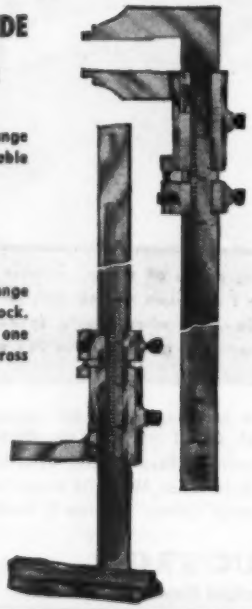
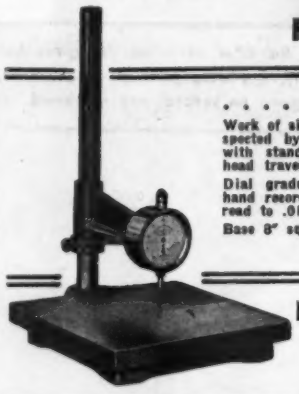


AMERICAN MEASURING INSTRUMENTS CORP.
240 WEST 40th ST. • NEW YORK 18, N. Y.

The RANDALL & STICKNEY Platform Gauge



. . . . takes work up to 7 inches

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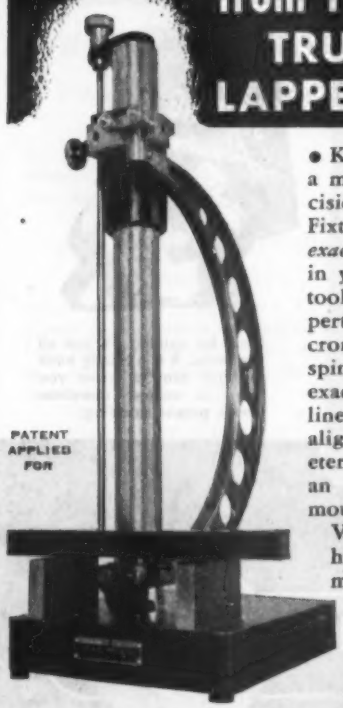

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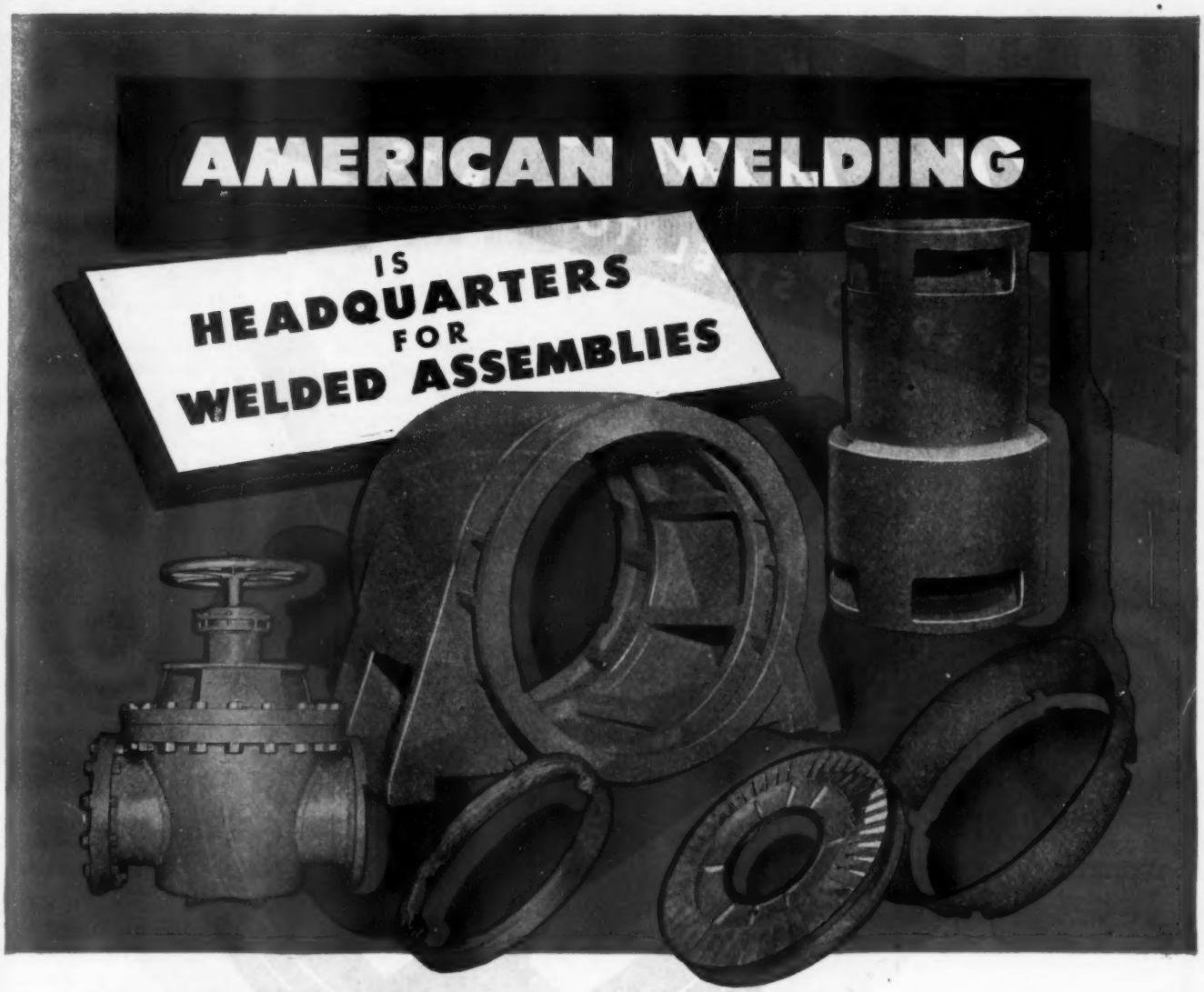

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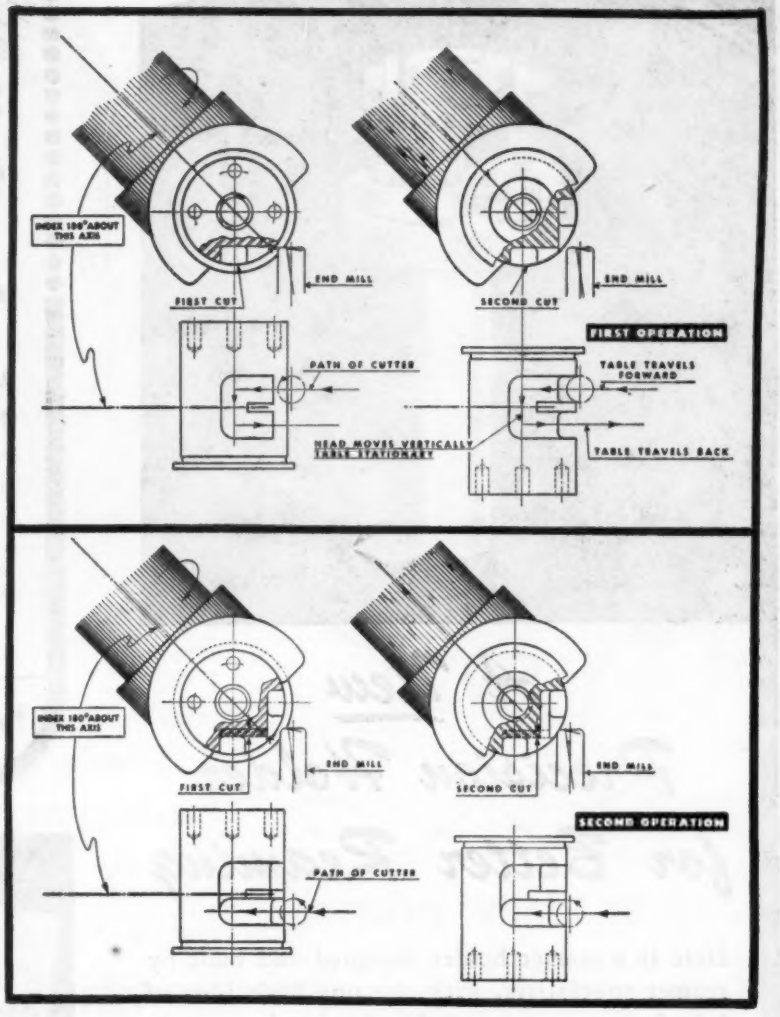
Directly below is a photograph of a part showing an intricate milling cut. This particular job was handled to advantage on U. S. Multi-Millers. Two operations (each operation involving two cuts) are required to complete the piece.

The first operation is performed on an MM-1-5-2 U. S. Multi-Miller equipped with a Cam-controlled Automatic Table Feed, Cam-controlled Automatic Vertical Feed of the Spindle Head, and Special Indexing Fixture. An illustration of the MM-1-5-2 U. S. Multi-Miller showing the arrangement for vertical feed of the spindle head is shown at the lower left of this page.

The second operation is handled on an MM-1-6 U. S. Multi-Miller which does not include the automatic vertical feed of the spindle head. This machine is equipped with the same fixture used for the first operation.

The sequence of operations is given below, and the drawings at the right indicate the various steps.

This is just one of the many different types of milling operations which can be handled to advantage on the U. S. Multi-Millers. A complete description of the Multi-Millers is found on pages 2 through 7 of our General Catalog. Ask for your copy.



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1st CUT ON FIRST OPERATION
(Performed on MM-1-5-2 U. S. Multi-Miller)

1. Fast approach of table (with work fixture) to cutter.
2. Cut at correct feed to proper longitudinal depth.
3. Table motion automatically stops and spindle head automatically descends to perform the vertical portion of the cut.
4. Motion of spindle head stops and table returns at proper cutting feed until cutter clears work.
5. Rapid return of table to starting position.

2nd CUT ON FIRST OPERATION
(Performed on MM-1-5-2 U. S. Multi-Miller)

1. Fixture is indexed end for end around axis shown in drawing.
2. Cycle given above for first cut is repeated.

1st CUT ON SECOND OPERATION
(Performed on MM-1-6 U. S. Multi-Miller)

1. Fast approach of table (with work fixture) to cutter.
2. Cut at proper feed to longitudinal depth.
3. Return at same feed until cutter clears work (returning at same feed eliminates cutter marks).
4. Rapid return of table to starting position.

2nd CUT ON SECOND OPERATION
(Performed on MM-1-6 U. S. Multi-Miller)

1. Index fixture end for end around axis shown in drawing.
2. Cycle as given above for first cut repeated.

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Here is a reamer holder designed and built by reamer specialists, with the one basic idea of bringing to your turret lathes, hand and automatic screw machines, the full precision qualities inherent in L & I Ground Flute Reamers.

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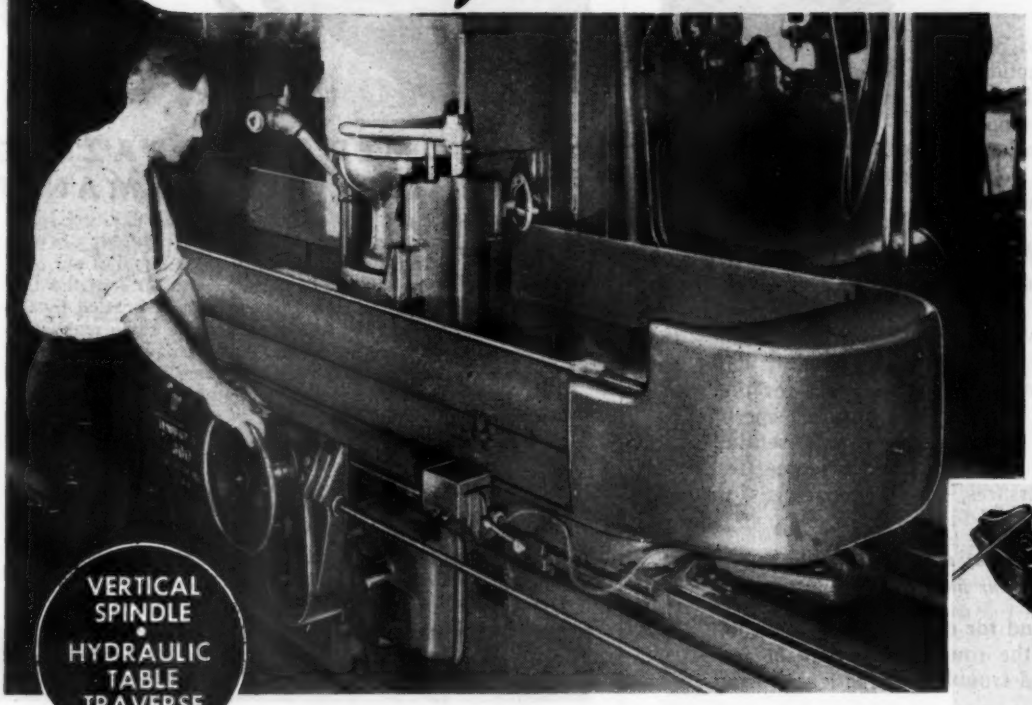

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Dies . . . Knives . . . File Blanks
Parts for Locomotives, Automobiles, Aircraft and Home Appliances.

The Hanchett 300 is built in several sizes, for varying requirements. And remember — Hanchett manufactures *all* types of Surface Grinders. If your problem is Grinding, consult Hanchett. You can be sure of unbiased information at no obligation. Write today for Bulletin 161-A1!

Write Today for Bulletin 161-A1

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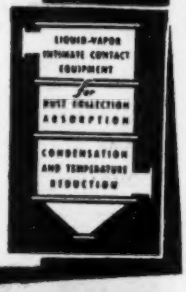

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If a tap is *kept sharp*—if a tap is *sharpened properly*—its life will be increased to a point where it need not be discarded until it becomes too short for any job.

The Blake Tap Grinder will keep taps at "original" sharpness throughout their life—it sharpens taps with any amount of relief desired—it handles either right- or left-hand taps with 2, 3, 4, 5, 6, 8, or 10 flutes—it is fast and economical to use—it soon pays for itself by lengthening tap life, reducing broken taps and scrapped work.

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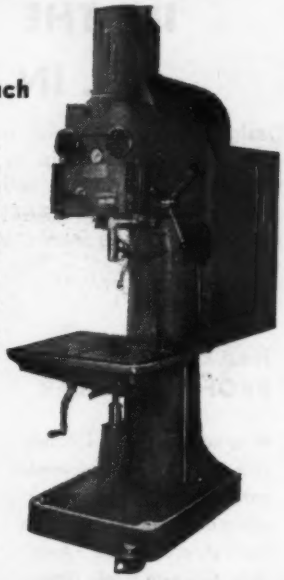

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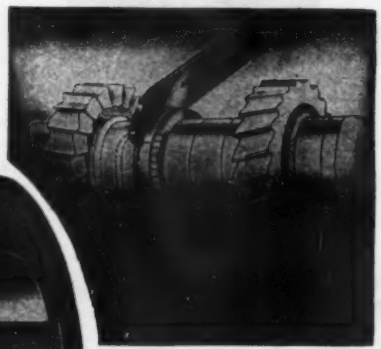

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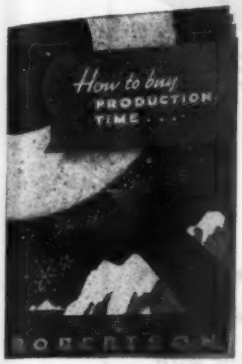
"now you can buy PRODUCTION-TIME"



This pocket-size booklet, "How to Buy Production-Time," tells the full story of Robertson Cool-Cut wheels. Write, on your business letterhead, for a free copy.

There are only 24 hours in a day and nothing you can do will add to the total. But the *production* you can get out of those 24 hours can be greatly increased. You can *buy* production-time by buying the right grinding wheel for the job.

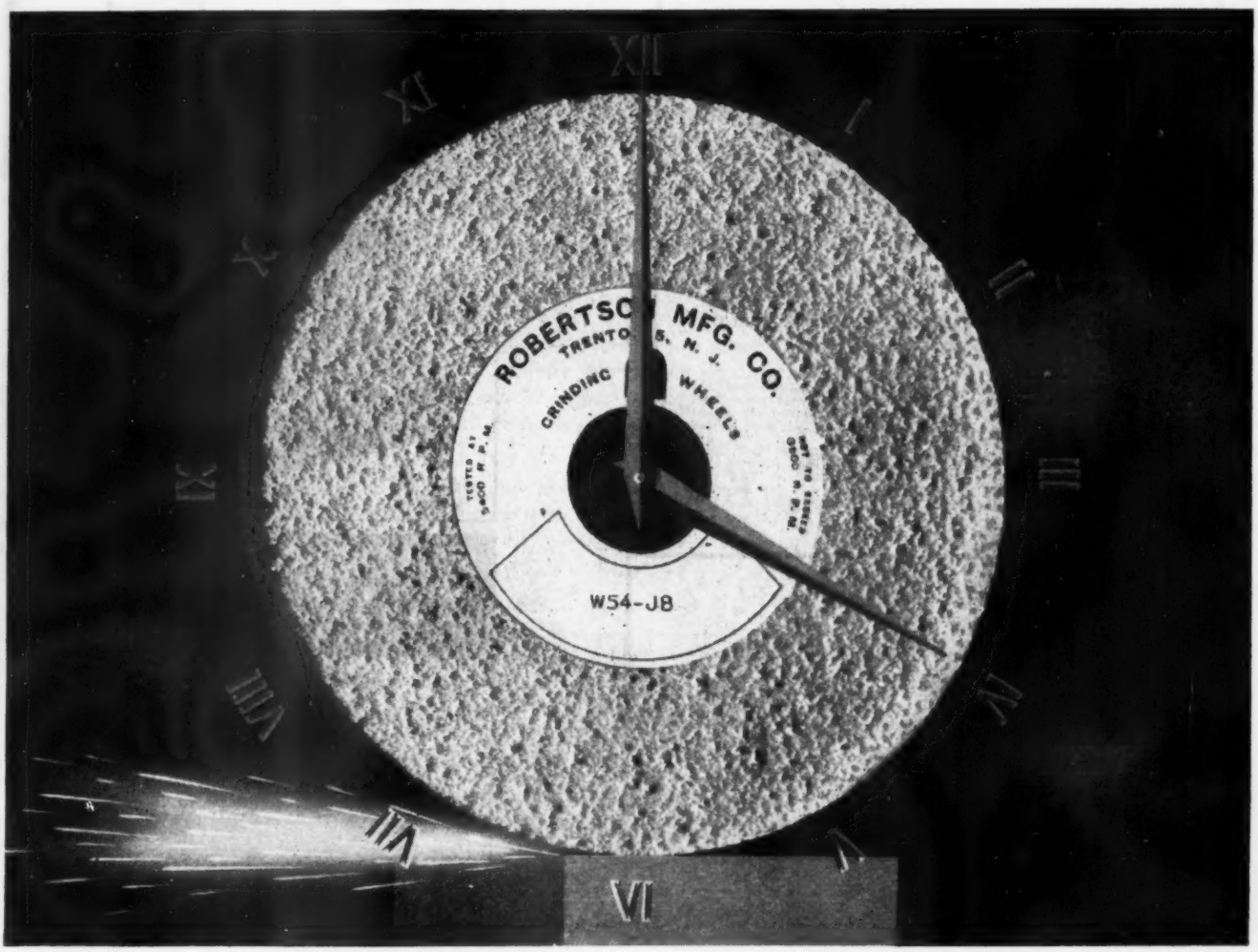
Robertson's new, Cool-Cut wheel is no cure-all for every grinding problem, but, properly applied, it can step up your production-time to a remarkable degree. Here, for example, is what a Robertson Cool-Cut did for one customer:

Using an 18″ x 5″ x 15″ conventional wheel, on a Hanchett Vertical Surface Grinder, for .040″ to .060″ stock removal from 1020 steel, 5/8″ thick, the customer was turning out only 26 pieces in 2 hours and 40 minutes, with an ampere reading of 60. Wheel feed was two ten-thousandths per chuck revolution.

When, on the recommendation of a Robertson Sales Engineer, a W24-H-2 Robertson Cool-Cut wheel was tested on the same job, production jumped from 26 pieces to 170 pieces in the same time, with an ampere reading of between 37 and 40. Wheel feed was increased to eight ten-thousandths per chuck revolution.

In other words, the Robertson Cool-Cut wheel increased production on this particular job *more than 6 times* and with a substantial saving in power-cost too! Would you like to buy that kind of production-time for *your* shop?

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY
Manufacturers of Vitrified Bonded Grinding Wheels, Mounted Wheels, Segments



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The cutters are also popular in general machine shops for cutting holes in sheet materials and for making gaskets. In the latter case, arms with two bit holders are frequently furnished.

The Circle Cutter is made in two standard models. One has a No. 2 M. T. shank as illustrated. The other has a ½″ straight shank. Either model complete with Pilot Drill and Bit, $18.00. Special models will be made to order.

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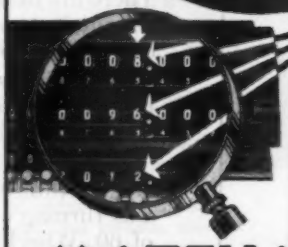

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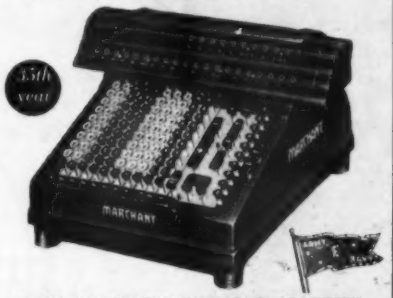

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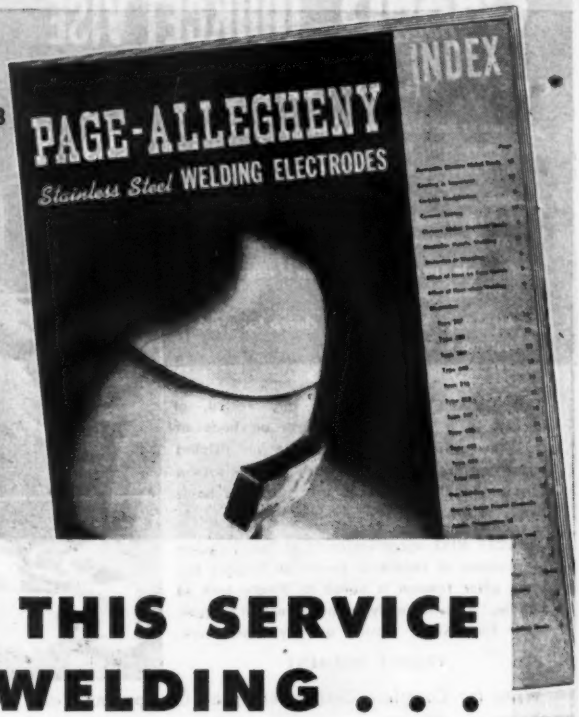

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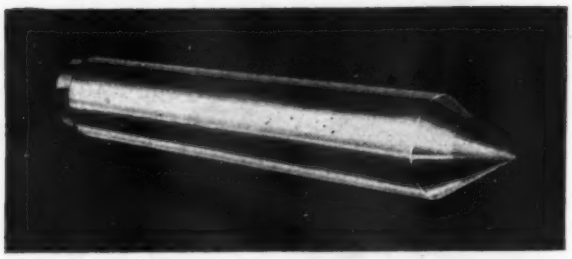

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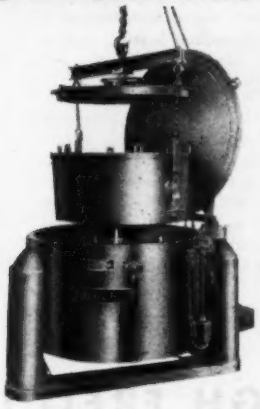

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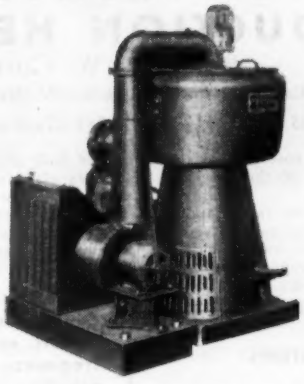

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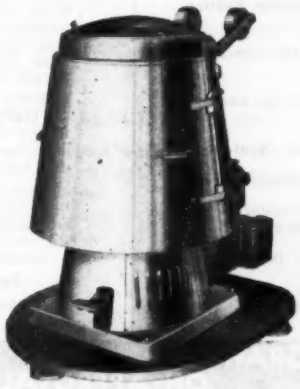

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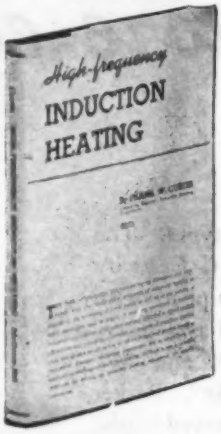

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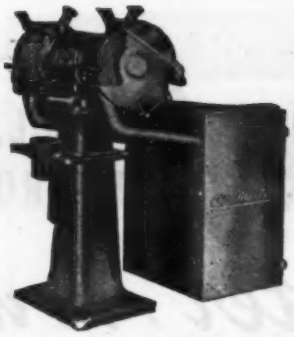

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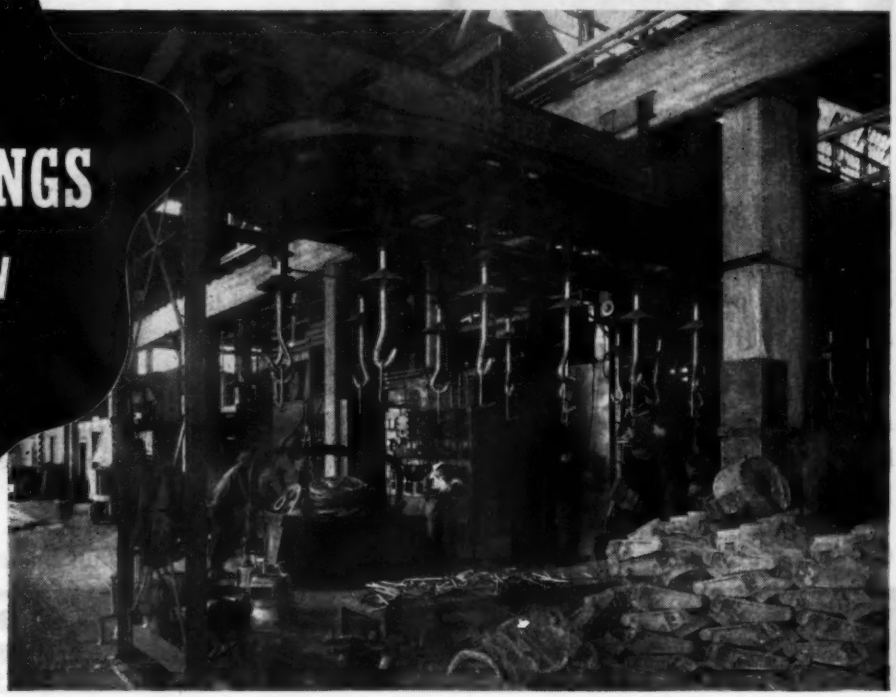

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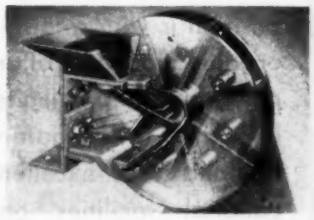

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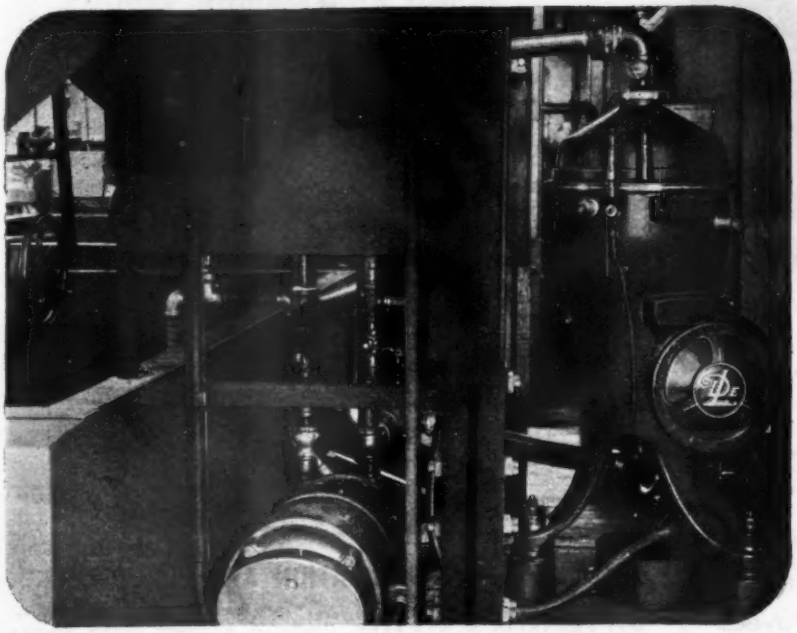

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AT the Bedford, Ohio, plant of Jack & Heintz, Inc., grinding coolant is freed of abrasive and metallic sediment by means of De Laval "Hermetic" Coolant Clarifiers. The coolant, entering the De Laval machine under a pressure of 85 psi, is clarified by centrifugal force and discharged under 15 psi pressure. The airtight construction of the De Laval "Hermetic" Clarifier eliminates aeration or foaming and the coolant can be piped directly to the grinders. Grinding can be done nearer finish dimensions, with much less likelihood of distorting the work, when coolant is clarified the De Laval way.

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- Details are available in Bulletin FG-17. Write for your copy.

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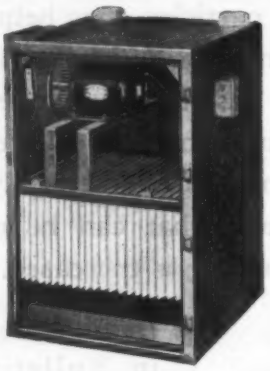

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We can handle your stamping and assembly requirements in any metal. Our modern equipment and methods coupled with 50 years of experience is your guarantee of accuracy and efficiency. Our facilities include capacity for handling screw machine products, tools, dies, jigs and fixtures.

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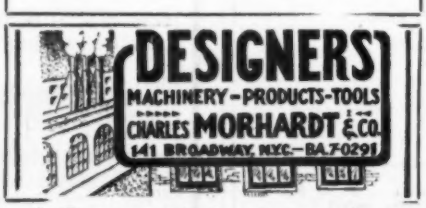

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in round, flat, square and special shaped wire in all metals.

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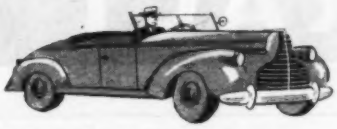
Additional Contract Work Advertising on page 316



IN A CAR

OR A MACHINE TOOL

IT'S NOT AGE, NOR USE...BUT

abuse

that determines operating efficiency

Your ten-year-old automobile has gone over 60,000 miles. It runs fine, rarely gives you trouble. You drive it intelligently, service it regularly.

My three-year-old one, mileage under 15,000, runs awful. I'm going to turn it in for a new one first chance I get.

Let's face the facts.

Is it age, use or abuse that makes the big difference?

DURING the last four years many newly built machine tools have been operating the clock around, often in semi-skilled hands and with a minimum of normal maintenance. In terms of a machine tool's average life span of useful operation, they are new. Actually they're less productive than machine tools several times older which have received skilled operation and regular maintenance.

Now is the time to estimate the efficiency of these machine tools...not by the yardstick of age, nor of use, but of abuse. The same holds for late-type surplus tools purchased for peacetime use from government stocks.

Management, in many of the country's reconverting plants, is making similar surveys of its metal-working equipment and then initiating systematic programs of *Engineered Rebuilding* by Simmons.

Simmons methods have converted planers into hydraulic grinders, doubled the capacity of planers, converted entire plants from belt-driven tools to individual, self-contained motor driven units, lengthened beds and tables, widened housings and provided gear transmissions and other labor-saving devices.

Engineered Rebuilding can play a major part in setting up your new production line. Start today by sending us a list of the machines you need rebuilt. We'll show you how "The Simmons Way" can speed your program.

SIMMONS MACHINE TOOL CORPORATION
1759 NORTH BROADWAY, ALBANY 1, NEW YORK

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MANUFACTURERS FOR INDUSTRY SINCE 1875

Special Machines, Jigs, Fixtures and Production work. Complete facilities to serve you.

AMERICAN TYPE FOUNDERS, INCORPORATED
Cowdrey Machine Division
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FORGING ITEMS WANTED FOR

800 lb., 1000 lb., 10,000 lb. steam drop forging hammers.
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This forging equipment supplemented by flat die steam hammers, bulldozers, presses shears, etc.
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PRECISION FORM GRINDING
Specialists in grinding Circular and Flat FORM TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.
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EXCESS CAPACITY AVAILABLE:
Guaranteed Machine Tool Rebuilding—Special Machinery and Parts—Contract Work.
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BARRETT MACHINE TOOL COMPANY
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PRECISION PARTS MADE TO YOUR ORDER

A manufacturer of precision pumps for the aircraft industries can handle volume production on precision parts for automobiles, air compressors, refrigerators, washing machines, vacuum cleaners, etc. Equipment includes turret lathes, grinders, millers, drill presses, heat treating, etc. All modern machinery.

ROMEC PUMP COMPANY
ELYRIA, OHIO, U. S. A.

PATTERNS in WOOD and METAL
for All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them
GENERAL PATTERN WORKS
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Specializing in molds for the Rubber Industry also facilities for automatic screw machine work up to 11/16.
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146 Orono Street Clifton, N. J.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

WANTED
INDUSTRIAL CONTROL ENGINEER

We are interested in securing an electrical engineer to develop industrial control apparatus.

Applicant should be familiar with competitive designs, and have working knowledge of tests and working methods. Underwriter's requirements and NEMA standards for electric motor control.

Excellent opportunity to qualify for a permanent supervisory position in Engineering Department of an expanding organization well established in the automotive electrical and magnetic relay field. In applying give age and complete resume of experience.

R-B-M MANUFACTURING CO.
Division Essex Wire Corp.
LOGANSPORT INDIANA

POSITIONS VACANT

WANTED: TOOL DESIGNERS. Graduate engineer or equivalent, specific experience in design of tools, fixtures, gages, etc., for manufacture of small interchangeable metal parts and a definite interest in design problems. Good post-war prospects. State age, marital status, details of education, experience, draft status, present salary and expected salary. Enclose recent photograph or snapshot. Applicants must be able to obtain statement of availability. Remington Arms Company, Inc., Personnel Relations Division, Bridgeport, Conn.

WANTED: GUN Designers. Graduate engineer or equivalent, thoroughly trained in the fundamentals of mechanical engineering and in the design and development of sporting arms or small interchangeable metal parts. Ability to recognize and analyze weaknesses in design of mechanisms and invent simple, sturdy substitutes. Ingenuity and a liking for sporting arms are desirable. Good post-war prospects, state age, marital status, details of education, experience, draft status, present salary and expected salary. Enclose recent photograph or snapshot. Applicants must be able to obtain statement of availability. Remington Arms Company, Inc., Personnel Relations Division, Bridgeport, Conn.

POSITIONS VACANT

WANTED: MACHINE Design and development engineers, Graduate engineer or equivalent, experienced in the design and developmnt of automatic and semi-automatic machines concerned with manufacture of sporting arms and sporting arms ammunition or with manufacture of small interchangeable metal parts. Creative ability and initiative are essential and a sound training in economic evaluations of manufacturing processes. Good post-war prospects. State age, marital status, details of education, experience, draft status, present salary and expected salary. Enclose recent photograph or snapshot. Applicants must be able to obtain statement of availability. Remington Arms Company, Inc., Personnel Relations Division, Bridgeport, Conn.

MECHANICAL ENGINEER with several years experience in design and operation of dies for small blanking and forming operations. Permanent position. State training, experience and salary expected. C. Howard Hunt Pen Co., Camden, New Jersey.

MASTER MECHANIC Wanted—Man preferably with technical education to head up master mechanic's office. Must have had automotive or aircraft production experience. P-437, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on opposite page)

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

(Not available for equipment advertising)

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(See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

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The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M. September 26th will appear in the issue of October 11th subject to limitation of space available

POSITIONS VACANT

(Continued from opposite page)

WANTED FACTORY Manager—Man experienced in planing scheduling, machine welding and inventory control, preferably with technical education. Automotive engine or aircraft engine experience necessary. Prefer man 30 to 45 years old. Company's product, internal combustion engines. P-438, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. Reconversion is creating lifetime opportunities now. This thoroughly organized confidential service of 35 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated, through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

SALES ENGINEER—Age 49, experienced in sales, design and manufacture of all types of tooling. 12 years' experience with carbide tooling. Has practical shop and sales executive experience. PW-394, American Machinist, 330 W. 42nd St., New York 18, N. Y.

FACTORY MANAGER or production executive. Age 44, with 21 years' experience in metal goods manufacturing. Extensive knowledge of production planning, layouts, costs, job evaluation, time study, quality control inspection and personnel management. Jobbing and mass production operations, heat treating, metal finishing, assembly and tool room operation. Have excellent rating for management of division with 3,200 employees and company with 1,500 inspectors. PW-419, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MECHANICAL ENGINEER, age 42, with tools, dies, special machine design experience, method engineer, research and development engineer with proved supervisory ability along the lines referenced above, desires supervisory position with a progressive company. PW-420, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EXECUTIVE—TECHNICAL graduate, now employed as management engineer, desires position as Works Manager, Plant Superintendent or Production Engineer. 20 years' broad experience foundries, rolling, tube and wire-drawing mills, sheet metal and fabricating shops, chemical, etc. industries, installing management controls, product and equipment design and development, methods, time studies, plant layout, construction and maintenance, material handling equipment, labor relations. Excellent record in plant modernization and reconversion. Eastern territory preferred. PW-440, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 320)

TO ABLE, AMBITIOUS MEN

In Administration, Manufacturing, Engineering, Designing and Sales, who have good reasons for seeking wider opportunities, we offer **AT NO CHARGE** a dignified means of bringing their qualifications before interested employers.

To Industry we offer confidential Personnel Management Service on a fee or retainer basis.

CURT E. PATTON PERSONNEL ENGINEERS
53 W. Jackson Blvd. Chicago 4

Chief Research Engineer

A well established and progressive organization located nearby New York City, engaged in the mass production of small precision metal articles needs an eminently qualified man age 40 to 50, to head up its Research Department.

This man must be capable of heading a research organization dealing in mechanical, metallurgical and electro-chemical problems; preferably one with wide experience in the mechanical field. He must have already demonstrated ingenuity, inventiveness and executive ability.

Write complete details of experience, education and salary requirements.

BOX 219, REALSERVICE
110 W. 34th St., N. Y. 1, N. Y.

Development Engineer

Graduate engineer or equivalent experienced in designing and development of small precision die casting dies for high speed production. He must be thoroughly acquainted with modern diecasting methods and practices. Knowledge of recent developments in plastics desirable. Practical toolroom experience is an essential qualification. Unusual opportunity for one who possesses executive ability and initiative.

Our company is well established and engaged in the mass production of small metal articles at close tolerances. Location of plant near New York City.

Age 35 to 45. Write in detail stating experience, education and salary requirements.

BOX 199, REALSERVICE
110 W. 34th Street, N. Y. 1., N. Y.

Design Engineer

Age 35 to 50; must possess thorough knowledge in the design of precision automatic machines and accept responsibility for planning and designing equipment leading to greater mechanization of production operations.

Sr. Tool Engineer

Age 35 to 45; Must be experienced in the design and development of small interchangeable tools and dies. Creative ability required. Practical toolroom experience is an essential qualification.

Engineer Checker

Age 35 to 45; Graduate engineer experienced in checking intricate precision machine and tool designs. Should have designing and practical shop experience.

These openings are with a well established and progressive organization engaged in the manufacture of small metal articles to close tolerances and offer unusual opportunities for men with executive ability and initiative. Plant located near New York City.

Write fully giving details of experience, education and salary requirements.

BOX 246, REALSERVICE
110 W. 34th St., N. Y. 1, N. Y.

WANTED: Machine Tool Engineer

Preferably with experience in high-production milling and turning. Must have sales ability and be willing to travel in vicinity of Chicago. Give full outline of qualifications.

P-433, AMERICAN MACHINIST
520 North Michigan Avenue, Chicago 11, Ill.

OPPORTUNITY FOR EXECUTIVE MECHANICAL ENGINEER

Must be capable of earning a minimum of $7500 annually. Assume responsibilities of taking complete charge of machine shop and development works. Must be thoroughly experienced with mass production precision work on small parts. Small electric motor experience desirable but not necessary. Excellent opportunity for permanet position and advancement with aggressive organization.

Write full details in explanatory letter to

P-436, AMERICAN MACHINIST
330 WEST 42nd STREET NEW YORK 18, N. Y.

(Additional Positions Vacant Ads on pages 316 & 318)

THE TIMKEN ROLLER BEARING COMPANY

at CANTON, OHIO

has several openings for design engineers.

The work offers opportunities for permanent connections leading to engineering sales and service positions.

Send details of your experience, technical training, previous earnings, salary requirements and photograph with your application to the Vice President of Engineering.

WANTED

MECHANICAL ENGINEER

Must be thoroughly experienced in all gear manufacturing problems as well as designing; only those with extensive gear experience need apply. Exceptional post-war opportunity. Write full history including name of university and year graduated; names and addresses of all former employers; age; salary desired.

P-345, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Tool Room Superintendent

A well established progressive company requires the services of a qualified Toolroom Superintendent. Essential requirements are an engineering background and a minimum of 10 yrs. diversified practical experience in the manufacture of small interchangeable dies and tools.

He should have the ability to plan and direct results and secure results economically. The company is nationally known and is engaged in the manufacture of small metal articles. Location near New York City.

Age 40-50; Write fully giving details of experience, education and salary requirements.

BOX 18, REALSERVICE
110 W. 34th St., N. Y. 1, N. Y.

Factory Superintendent

A well established progressive firm requires the services of a qualified executive to take charge of production. Essential requirements are a sound engineering background and experience in mass production of small metal articles to close tolerances. He should have the ability to plan and direct quality production, secure results economically and have the knack of getting others to work with him and for him.

Our company is nationally known, is located nearby New York City, has modern plant facilities and offers a real opportunity and future for the right man. Age about 40-50.

Write fully giving details of your experience, education and salary desired.

BOX 151, REALSERVICE
110 W. 34th St., N. Y. 1, N. Y.

WANTED

MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions.

Only men 35-55 with a record of successful achievements will be considered. In replying furnish information preliminary to a conveniently arranged interview.

THE TAFT-PEIRCE MFG. CO.
Woonsocket, R. I.

WANTED

CHIEF INSPECTOR

Man experienced in inspection of all types of precision gears. Must be familiar with all types of checking equipment and well grounded in gear cutting. Write fully giving details of experience, education and salary requirements.

P-396, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER

Wanted by an Eastern Manufacturer of Dyeing and Processing Machinery. Prefer man about 35 to 45. Should be a graduate mechanical engineer with several years shop experience, must be a good organizer and well versed in modern shop and sheet metal practice. To take complete charge of Engineering Department with a force of 6 to 8 men. Submit an outline of your qualifications.

P-414, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

ASSISTANT GENERAL MANAGER

Man experienced in all phases of precision gear cutting in small well-equipped plant. Excellent opportunity for man with all-round gear experience. Write fully giving details of experience, education and salary requirements.

P-397, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

DRAFTSMEN — DESIGNERS

Needed in the Development and Research Department of an old established and progressive Chicago manufacturing company. Excellent opportunity for men with ingenuity and designing ability. Experience in drafting and designing small mechanical and electrical devices is required. Engineering degree desirable but optional.

P-429, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

ENGINEERS—JUNIOR AND SENIOR

Must have thorough knowledge of modern machine tool design practice and must be willing to do board work. Excellent post war opportunities. Please give complete record of your past experience and address your replies to the

Personnel Director

THE CROSS COMPANY
3250 Bellevue Ave., Detroit 7, Mich.

WANTED

GRADUATE ENGINEERS

A progressive builder of precision machine tools located in the Middle West, has openings for two or three young graduate engineers. One opening is for design engineer, where previous experience in a similar line is highly desirable, but other openings are available. If you would like to affiliate with a well-established company that is small enough so that individual merit is bound to receive just recognition, write, giving age, educational qualifications, salary expected, and experience. Present employer will not be contacted without previous permission.

P-430, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

Additional Positions Vacant Ads on pages 316 and 317

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

6—#61 New Britain-Gridley 6 Spindle 1⅝" cap. Automatic Screw Machines. A.C. Motor Drive, Threading Spindle.
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 4-Spindle Automatic.
2—#55 National Acme 1⅝" 4-spindle Automatics, complete.
1—#2G Brown & Sharpe Automatic.
1—#1 Brown & Sharpe Automatic, old style.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 Morse Taper. Table 20" x 67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13", 4 spindle (2). 2 spindle (1).

RADIAL DRILLS

3' 9" col. American, S.P.D.
3' Dreses 10" rd. col. QCG., M.D.
3' Fosdick 10" Col. Motor Drive.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
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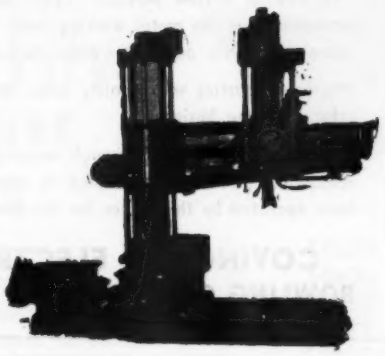
GRINDERS

12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
14"x36' Cincinnati, Plain, motor in base.
6"x32" Norton Cyl., overhead c/s drive.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
3—#2 Cincinnati Centerless Grinders.
1—4x12 Landis Hydraulic Cylindrical Grinder, New.

Blanchard Grinder #16, 30" dia. Magnetic Chuck, 25 HP 3-60-440 V. Motor.

Pratt & Whitney Vertical Surface Grinder, 14"x36" with 10"x36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

LATHES

14 x 6 Pratt & Whitney semi—Q.C.G.
16 x 8 Hendey Arranged M.D., Taper
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
Putnam, 26 x 12 Heavy Q.C.G., arr. for M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
14 x 6 Hendey Toolroom Lathe, G.H., M.D.
14x8 LeBlond Toolroom Lathe, cone drive.
14" x 6' Hendey 12-speed geared head, motor in base.

MILLING MACHINES

#3, #4, #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Millers.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.
#1-#2—Kempsmith Plain Milling Machines
#2½ #3 LeBlond Universal.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.

POWER PRESS HEADQUARTERS

#4½ Bliss D.C. B.G. Forging 3" stroke.
200 ton A.C.F. Hydraulic Press. Bed 24"x 36", 4-post.
7—25 ton Model SL2 K.R. Wilson hydraulic Presses.
Beck Duplex Embossing Press.
75 ton H.P.M. 2 post, Hydraulic Press.
#1 Bliss Straight Side, double action, Cam Press. Will draw and lift out 2¾".
#69N Bliss O.B.I. Cam.

SHAPERS AND GEAR CUTTERS

12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
#13 Brown & Sharpe Spur & Bevel Gear Cutter.
24" Potter & Johnston Crank Shaper, universal table, power feed to head.

SHEARS & METAL CUTTING MACHINERY

Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Bliss #232 Slitting Shear, 14 ga.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 16 ga. x 42" Gap Foot Shear.
Niagara #9S Power Seamer.
Niagara 4"x42" Geared Slip Roll Former.
Niagara 3" x 36" Geared Slip Roll Former.
Niagara 48" Roller Leveller. 6 Roll.
Niagara #30 Beader & Flanger.
Niagara #0 Beader.
Niagara #4-E Squaring Shear, 48" x ¼" capacity, M.D.

MISCELLANEOUS

Waterbury-Farrel Cold Header, double stroke, open die, ½" cap. & 6'.

Manville Cold Header, single stroke, solid die, 3/16" cap.

J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Hydraulic Pumps—Hele Shaw, Racine, Oil Gear, Motor Driven.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.
Standard Automatic Drop Hammer, 300#.

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY
Machinery Merchants

18 WARD ST.
ROCHESTER 5
N. Y.

SEARCHLIGHT SECTION

POSITIONS WANTED
(Continued from page 317)

JUNIOR MECHANICAL Engineer—Experienced in the design of mechanisms, with four years tool and die maker's background. Technical background consists of four years college in mechanical engineering plus four semesters industrial electronics. Desires permanent position in test or experimental laboratory. Also capable of design and working in conjunction with shop on tool and fixture set ups. PW-439, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MECHANIC WITH broad knowledge of industrial diamonds and diamond-tool application; also experience in powder metallurgy and instrument manufacture; desires position in development of equipment and process control where this training will be helpful. PW-441, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CHIEF OR Assistant chief inspection supervisor with extensive precision gear experience, familiar with all types of checking equipment, well grounded in gear cutting and manufacture, four years assistant chief inspector gear laboratory, five years gear experience, one year tool inspection, six years general machine shop experience; engineering background, majored in mathematics, age 31. PW-442, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SALESMEN WANTED

WANTED SPECIALTY salesmen to sell small grinding fixture. This is fast selling, also repeats. Prefer salesmen who are making direct contact with factories. Letter should contain full particulars plus territory now covering. Territory available in many sections. P. O. Box 113, Brookville, Ohio.

REPRESENTATIVE AVAILABLE

GRADUATE ENGINEER, twenty years equipment and mill supply sales, desires additional lines for Southwest area. Acme Engineers, Box 5155, Houston 12, Texas.

BUSINESS OPPORTUNITIES

MACHINE SHOP, well equipped, established many years serving logging, sawmill, and farming area, Western Oregon college town. Columbia Engr. Co., Porter Bldg., Portland 4.

CURTIS & CURTIS pipe threading and cutting off machine line for sale, with rights to manufacture, use of name, drawings, parts and correspondence. BO-423, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D.C.

WANTED

POST WAR PRODUCTS

TO MANUFACTURE

Well equipped metal manufacturing and fabricating plant of 25 years' experience, with skilled personnel capable of accurate design and production work, desires to contact parties who have machine parts or machines to manufacture.

WHALEY ENGINEERING CORP.

P.O. Box 1336 Norfolk 1, Va.

PROFESSIONAL SERVICES

Contract Termination Specialists
CONSULTANTS, ADVISORS, NEGOTIATORS
We will assume full charge of your TERMINATED WAR CONTRACTS
Govt. Trained—Our charges included in post termination expenses.

ROBERT L. COLLUM ASSOCIATES

Room 637 11 West 42nd St., N. Y., N. Y.

UNUSUAL OPPORTUNITY

See our advertisement for Contract Work on page 316

The owner of the plant advertised above wishes to develop the plant into a larger, more efficient operation, therefore, consideration will be given to the following

The sale of fifteen percent (15%) interests to three reliable individuals who are experienced in the metal working field. Specialists in sales, engineering and executive management are desired in order to create most efficient development.

Interested parties who qualify after thorough investigation will be given full details relative to the business.

Proposition will justify thorough investigation as it is not a high priced idea but is a reasonably priced concrete plan to continue the development of a business that has been operated by this owner for the past twelve years in the same city.

COVINGTON ELECTRICAL MECHANICAL CO.

BOWLING GREEN KENTUCKY

WANTED

SALES ENGINEERS

To represent a modern gear manufacturing plant. Must have a degree in mechanical engineering as well as extensive selling experience in the gear industry. Write full details including name of university and year graduated; names and addresses of former employers; salary and territory desired and other pertinent details.

SW-410, AMERICAN MACHINIST

330 W. 42nd St., New York 18, N. Y.

SALES ENGINEER WANTED

Thoroughly experienced, to handle high precision machine tools throughout New York, New Jersey and Long Island. Interesting conditions, excellent opportunity for future. State experience, qualifications, age, education, references and other pertinent details.

SW-432, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

IF YOU ARE BUSY, BUT NEED MACHINE TOOLS

Let me locate and obtain them for you from SURPLUS PROPERTIES. Just send your list with specifications and I will give you a preliminary appraisal quickly. Turnover growing daily, and New Tool Order Boards will be crammed. References.

A. S. PAWLING

Industry Consultant

1727 Massachusetts Avenue, N.W.
Washington 6, D. C.

FORGING EQUIPMENT

7" Ajax Upsetting Forging Machine
1500# Chambersburg Forging Hammer
3000# Chambersburg Steam Drop Hammer

IRON & STEEL PRODUCTS, INC.

13408 S. Brainard Ave. Chicago 33, Illinois

ANYTHING **containing IRON or STEEL"**

WANTED

WANTED BY REYNOLDS...

100 to 200 ton Knuckle Joint Power Press.

Grenby External Grinder.

24" and 36" Bullard Vertical Boring Mills. Must be 1942 or later.

100#, 200#, 300# and 500# Standard Automatic Drop Hammers.

Engraver for hub and die cutting 10 to 1 reduction. Work from ½" to 3" in dia.

REYNOLDS MACHINERY CO.

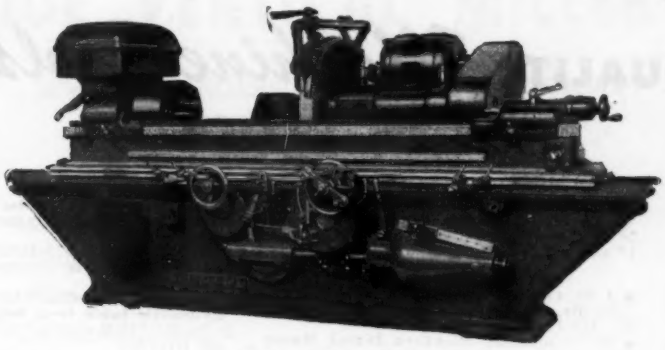
210 Eddy St. Providence 3, R. I.

WANTED BY
SMALL BOLT & NUT PLANT

COLD HEADERS—DOUBLE STROKE—BOLT TRIMMERS — ROLL THREADERS — SCREW SLOTTERS—#2 Surface Grinder—Power Feed Must be late machines in excellent condition. Give full particulars, including price.

W-415, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

HILL-CLARKE
Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



SIZES AVAILABLE

10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
10x120	16x36	

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke patented Multiple V-belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD **CHICAGO 6, ILL.**

MOREY *DEPENDABLE* USED MACHINERY

BORING MILLS—Horiz.—Vert.

BULLARD 24" Vert.—M.D.
BULLARD 42" Vert. N.E. type—M.D.
GISHOLT 42" Vert.—2 heads
N.B.P. 1½" bar Portable floor type—Horiz.

DRILL PRESSES

AVEY No. 3, single spindle
AVEY No. 2, 3-spindle
COLBURN D-2 Upright
NATCO No. 12, multiple spindle
NATCO D-5 High Speed Multiple

GEAR CUTTERS

BROWN & SHARPE No. 13
FELLOWS No. 712
GOULD & EBERHARDT 36" Hobber

GEAR GENERATORS

GLEASON 3" and 6" Straight
GLEASON 10" and 15" Spiral
GLEASON 12" Straight

GRINDERS

NORTON 24" x 240" Plain
ARTER 8" Rotary Surface
ARTER Automatic Piston Ring
UNIVERSAL Hydraulic Spline Shaft

LATHES—Engine & Turret

SOUTH BEND 11" x 4'
LeBLOND 25" x 18' geared head
LODGE & SHIPLEY 30" x 26'; 2-carriages
MOREY No. 3 Universal Turret; 1½" capacity
WARNER & SWASEY No. 3A Univ. Turret

MILLING MACHINES

BROWN & SHARPE No. 3 Universal
MILWAUKEE No. 3B Universal
CINCINNATI No. 3 Vertical
BROWN & SHARPE No. 3 Vertical
MOREY 12" x 60" Thread
PRATT & WHITNEY 6"x20" Thread Model B
PRATT & WHITNEY 6x132" Thread
RICE BARTON 4" Duplex Spline
PRATT & WHITNEY 4" Spline
INGERSOLL 48"x48"x16' Adj. Rail, 4 swivel heads
INGERSOLL 36"x33"x8' Adj. Rail, planer type; 3 heads

PLANERS

GRAY 24"x24"x6'—1 head
CINCINNATI 36"x36"x10'—4 heads
HAMILTON 42"x42"x20'—4 heads; DC motor drive
GRAY 48"x48"x16'—4 heads
GRAY 72"x48"x12'—2 heads
WOODWARD & POWELL 10'x60"x20'—4 heads

SHAPERS—Horiz. and Vert.

MOREY 8" and 12" Vertical
PRATT & WHITNEY 6" and 10" Vertical
MORTON 30" Draw Cut—Horizontal

MISCELLANEOUS

DILL 18" Slotter
ESPEN LUCAS No. 138 Cold Saw—12" Cap.
SAUNDERS 8-18" Pipe Machine
TREADWELL 12" Pipe Machine
MORTON 60" Stroke Planing & Boring Machine

PARTIAL LIST — *Send us your specific inquiry.*

MOREY MACHINERY CO., Inc.

410 BROOME STREET **NEW YORK, N. Y.**

QUALITY *Machine Tools* NOW IN STOCK

No. 61—1⅛" NEW BRITAIN SIX SPINDLE AUTOMATIC SCREW MACHINE, with bar equipment, new in 1943.
No. 2 WARNER & SWASEY TURRET LATHE twelve speed, all geared head, with power bar feed, new in 1941.

AUTOMATICS

⅞" Cleveland Model M, four spindle.
¾" Gridley Model F, four spindle.
2" Cleveland Model A, single spindle.
1" x 5" New Britain, six spindle.

DRILLS

★ **4 Ft. Canedy-Otto Radial Drill, motor spindle, 11" column, new in 1942.**
No. 416 Baker, single spindle.
★ **21" Cincinnati-Bickford Direct Motor Driven Drill, single spindle.**
Allen Sensitive Drill, four spindle.
No. 11 Natco Multiple Drill, 16 spindle.
★ **No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse taper, rectangular head 20" x 40".**

GEAR CUTTERS

★ **No. 7, 71A, 715A Fellows Gear Shapers, all manufactured in 1936, with spur or helical guides, motor driven.**
No. 6 Fellows Gear Shaper, m.d.
★ **96" Gleason Spur & Bevel Gear Planer.**
No. 12 Barber Colman Gear Hobber.
No. 5-60" Brown & Sharpe Automatic Gear Cutter.

GRINDERS

★ **15" x 15" x 96" Norton Surface Grinder, m.d.**
No. 16-26" and No. 16-30" Blanchard Surface Grinder.
★ **No. 214-30" Besly Disc Grinder.**
No. 72A3 Heald Gagematic Internal Grinder.
No. 70 and 75 Heald Internal Grinders.
No. 13 Brown & Sharpe Universal & Tool Grinder.
★ **14" x 120" Landis Cylindrical Grinder, hydraulic table feed, new in 1942.**
10" x 36" "Hill-Clarke" Norton Cylindrical Grinder.
No. 2 Cincinnati Centerless.
★ **No. 3 Cincinnati Centerless Grinder, m.d.**

LATHES, ENGINES

★ **30" x 14' LeBlonde Heavy Duty, c.d.**
24" x 30' Lodge & Shipley, g.h.
20" x 8' Lodge & Shipley, c.d.
★ **18" x 8' American, 8 speed geared head.**
16" x 6' Pratt & Whitney, c.d., with relieving attachment.
★ **8" x 60" Fitchburg Lo-Swing, g.h.**

LATHES, TURRET

★ **No. 4L Gisholt, 9¼" spindle, chucking.**
No. 1A, 2A, 3A, Warner & Swasey.
2¼" x 24" Jones & Lamson, chucking, serial 40269.
★ **No. 6D Potter & Johnston Automatic Chucking and Turning Machine.**
No. 5A and No. 6A Potter & Johnston.
No. 2, 4, 6, Warner & Swasey, c.d.
★ **42" Bullard VTL, New Era type.**

MILLS

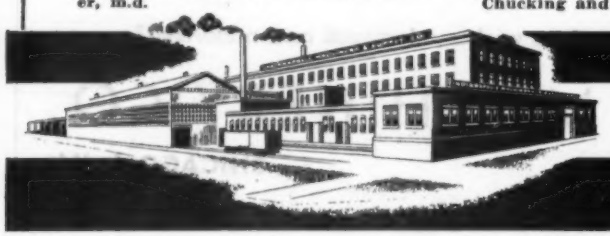
★ **No. 3B Milwaukee Universal, double overarm, m.d.**
No. 4 LeBlonde Plain, c.d.
★ **No. 2 Milwaukee Plain, double overarm, motor in base.**
No. 1A Milwaukee Plain, s.p.d.
★ **No. MM5 U. S. Multimiller, motor in base.**
18" Cincinnati Plain Mfg., s.p.d.
39" x 36" x 16' Ingersoll Rail Type.
★ **No. 4 Cincinnati Vertical, s.p.d.**
No. 2 Milwaukee Vertical, motor in base.
★ **3" Universal Horizontal Boring, m.d.**
6" x 14", 6" x 48", P. & W. Thread Mill.
4" Pratt & Whitney Spline Mill.

PLANERS

36" x 36" x 12' Woodward & Powell Planer, 2 heads.
24" x 24" x 8' American Planer, one head.
20" American Crank Shaper, s.p.d.
★ **6" Pratt & Whitney Vertical Shaper.**
4" Stevens Vertical Slotter, m.d.

SAWS

★ **No. 6 Marvel Hack Saw, cabinet base with tank.**



INDIANAPOLIS MACHINERY & SUPPLY CO., INC.

1961 S. Meridian St., Indianapolis 6, Indiana

EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: Balderas No. 31, Desp. 102, MEXICO, D.F.

OTT MACHINERY SPECIALS

AUTOMATICS, Acme 9/16" & 1" Mod. C 5 spdle.
AUTOMATICS, Acme 2" Model B 4 spdle., M.D.
AUTOMATICS, Gridley, 9/16", ⅞ & 1¼" Mod. G
AUTOMATICS, Cone, 1¼, 2½ & 3½" 4 spdle
CONOMATIC, 1⅛—8 spindle, M.D.
AUTOMATICS, Gridley, ¾, 1¼, 1¾, 2¼" & 2¾" Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 5¼" S. S.
AUTOMATICS, Cleveland 1¼, 1½, 2, 2½, 3½ & 4¾" Model A, M.D.
AUTOMATICS, Cleveland, ⅞, 1¼, & 2" Mod. B
AUTOMATICS, New Britain #22 and 24 Chuckers
AUTOMATICS, New Britain, ⅝ & 3¾" & 1x5" M.D., Bar Eqpt.
AUTOMATICS, Potter & Johnston #5a & 6a, M.D.
BORING MILLS, 30" Bullard, M.D.
BORING MILLS, Rockford, 3⅛" bar, Horizontal, 24x72" table, M.D. & 3½" Universal, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #8
GENERATOR, Gleason Spiral Bevel Gear, 10"
GRINDERS, Brown & Sharpe #2 & 3 Universal
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72 Hydraulic, 2 M.D.
GRINDERS, Bryant #3, 6 & 18 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Landis Hydraulic, 6x18" M.D.
GRINDERS, Pratt & Whitney, 12" Vertical Surface, M.D., 9x31", Magnetic Chuck
LATHES, Hendey, 16"x6' & 8' & 18"x10'
LATHES, Lodge & S, 20"x10' Geared Head, M.D.
MILLING MACHINES, #2 B Hvy. B&S Plain
MILLING MACHINES, Becker Vertical #5 & 6
MILLING MACHINE, Milwaukee #1B Plain & Universal #3B Plain, M.D.
MILLING MACHINES, #2 B Rockford Universal
PLANER, Gray 30"x30"x3' 2 Rail Heads
PLANER, Ohio 42"x42"x12' One Head, M.D.
PLANER-SHAPER, 30" Cincinnati, M.D.

OTT MACHINERY SALES, INC.
542 Second Avenue
Detroit 26, Mich.

MONA MEMBER

54" x 34' Houston, Stanwood & Gamble Heavy Duty G.H. Lathe, 30 hp motor, two carriages.
42" x 36" x 14' 4-head Ingersoll Adjustable Rail Type Milling Machine
8" x 48" Jones & Lamson Automatic Thread Grinder, 1940
#5 J&L Ram Type Universal Turret Lathe, 1940
#2L Gisholt Universal Turret Lathe
#5 Bardons & Oliver Universal Turret Lathe, bar & chucking, 1942
#2-S Van Norman Plain Milling Machine, 1942.

All latest type machines.
Many more. Send us your inquiries.

HAZARD BROWNELL
Machine Tools
350 Waterman St., Providence 6, R.I.
Dexter 8880

#3F-Fastermatic Turret Lathe, all Hydraulic, 4½" hole, 1 yr. old
#4 Univ. Milling Machine $2,500.00
5" Bar Newark Horizontal Boring Mill, 8' Bed, M.D., $2250.00
16x96 Landis External Grinder, self contained
#17 Barber Colman Heavy Duty Gear Hobber, can take a hob up to 5¾" dia.
16" 8-sp. Bullard Mult-Au-Matics, 2 yrs. old
B & S Surface Grinders 2 yrs. old
#40 Cross Gear Tooth Rounder, M.D.
300 amp. arc welders 1 yr. old
10x36 Norton Hydraulic Grinder, 1 yr. old

PAUL'S MOTOR AND MACHINERY SUPPLY CO.
MONA MEMBER
Detroit 8, Mich.
6111 Vermont Ave.
Tyler 76300

McDONALD USED MACHINERY

Rockford 24" Shaper, S.P.D. gear box.
Cleveland O.S. Planer 36"x8', 2 hds.
American 4' Radial Drill, encl. hd.
Cincinnati D.H. Planer 36"x36"x10', 2 hds.
Barnes geared Camelback Drill Press, 4 sp.
Bullard Vert. Turret Lathes, 24" & 36" S. Head
N.-B.-P. 84" Vert. Boring Mill, m.d. 2 hds.
Cleveland Horiz. Boring Mill, m.d. 2½" bar.
American 24" x 12' grd. hd. Lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach.
Blanchard Vert. Surf. Grinder, 26 rd. mag. chuck.
Diamond Horiz. Surf. Grinder, 12"x60" Table, m.d.
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cincinnati 48" Auto. Pl. Prod. Miller, S.P.D.
W.&S. No. 2A & #1-A grd. hd. Univ. Turret Lathe, S.P.D.
Foster No. 2F Fastermatic grd. hd. Turret Lathe, M.D.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 N. B'way. St. Louis 6, Mo.

For Sale

1⅞" Cone Automatics

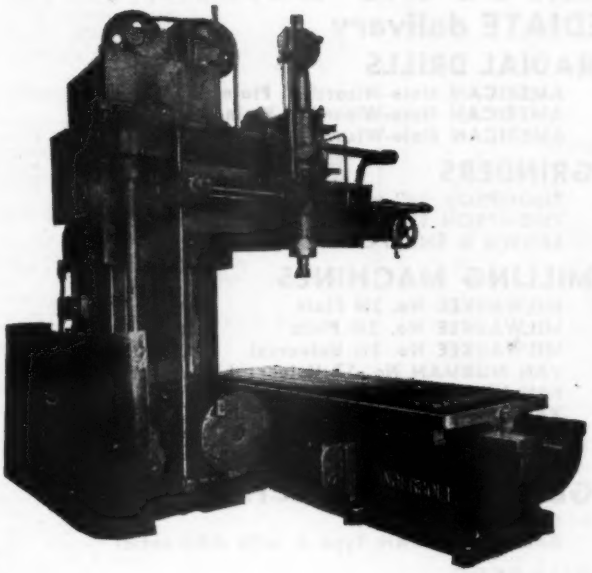
4 Spindle—Motor Drive

These Units were built in 1930, but reconditioned recently—"Now in Operation"—Complete with Stock Reels, Collets, Pushers, auxiliary Spindles, and about $2,000.00 inventory of repair parts.

4 AVAILABLE

GLOBE TRADING COMPANY
920 W. Lafayette Blvd., Detroit 26, Mich.
Phones—CAD. 0198-0199

INGERSOLL OPEN SIDE VERTICAL MILLER



30"x48"x96" INGERSOLL OPEN SIDE VERTICAL MILLING MACHINE

Table working surface 29" x 96".
Spindle vertical feed 24".
Table travel 96".
Maximum distance spindle to column 44".
Adjustable rail.
Power rapid traverse.
Arranged for motor drive.
Weight about 24,000 lbs.

IMMEDIATE DELIVERY

This machine is available for inspection at any time.

Wire — Write — Phone

EMERMAN MACHINERY CORP.

875 W. 120th STREET — CHICAGO 43, ILLINOIS

UNUSUAL VALUES

Blueprint machine—3 pieces
Brake, Robinson 5' toggle
Drill, high speed 7' over hang single spindle
Drill, two-spindle sensitive, #1 Morse taper
Drill, 4-spindle sensitive
Gear cutter, Brown & Sharpe #3—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
HackSaw, 12 x 12 Racine.
Two 18"x8' **Mueller lathes,** H.S. quick change gear
One 16"x6' **Hendey Lathe.**
Pipe Machine, 8" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
Punch & Shear two ½" & ⅝" capacity
Shaper 24" Gould & Eberhardt
Shaper, 16" Barker
Threading Machine #0 Webster & Perks
Tool Grinder Sellers new #0, #1 and #2 magic chuck and collets

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

TURRET LATHE TOOLS

For IMMEDIATE Delivery

SUITABLE for 1", 1½" and 2" CAPACITY TURRET LATHES

Ask for Catalog 943

MOREY

MACHINERY CO., INC.
410 Broome St., New York 13, N. Y.

HYDRAULIC

200 H.P. Hor. 4 Pl. Motor Driven Pump. Capacity 78 G.P.M. 4000#
2300 Volt Synchronous Motor 3 Phase 60 Cycle
ALSO—75 H.P. Hor. 4 Pl. Pump—50 G.P.M.—2000#
50 H.P. Vert. Triplex Pump—24 G.P.M.—2500#
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1—High Frequency Induction Furnace, 16 KVA capacity manufactured by Ecco High Frequency Corp., North Bergen, N. J. Purchased June, 1945 for $2750.00 received but never production operated.

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Miller, Univ. #3-B. Milw., SPD., Vert. Att.
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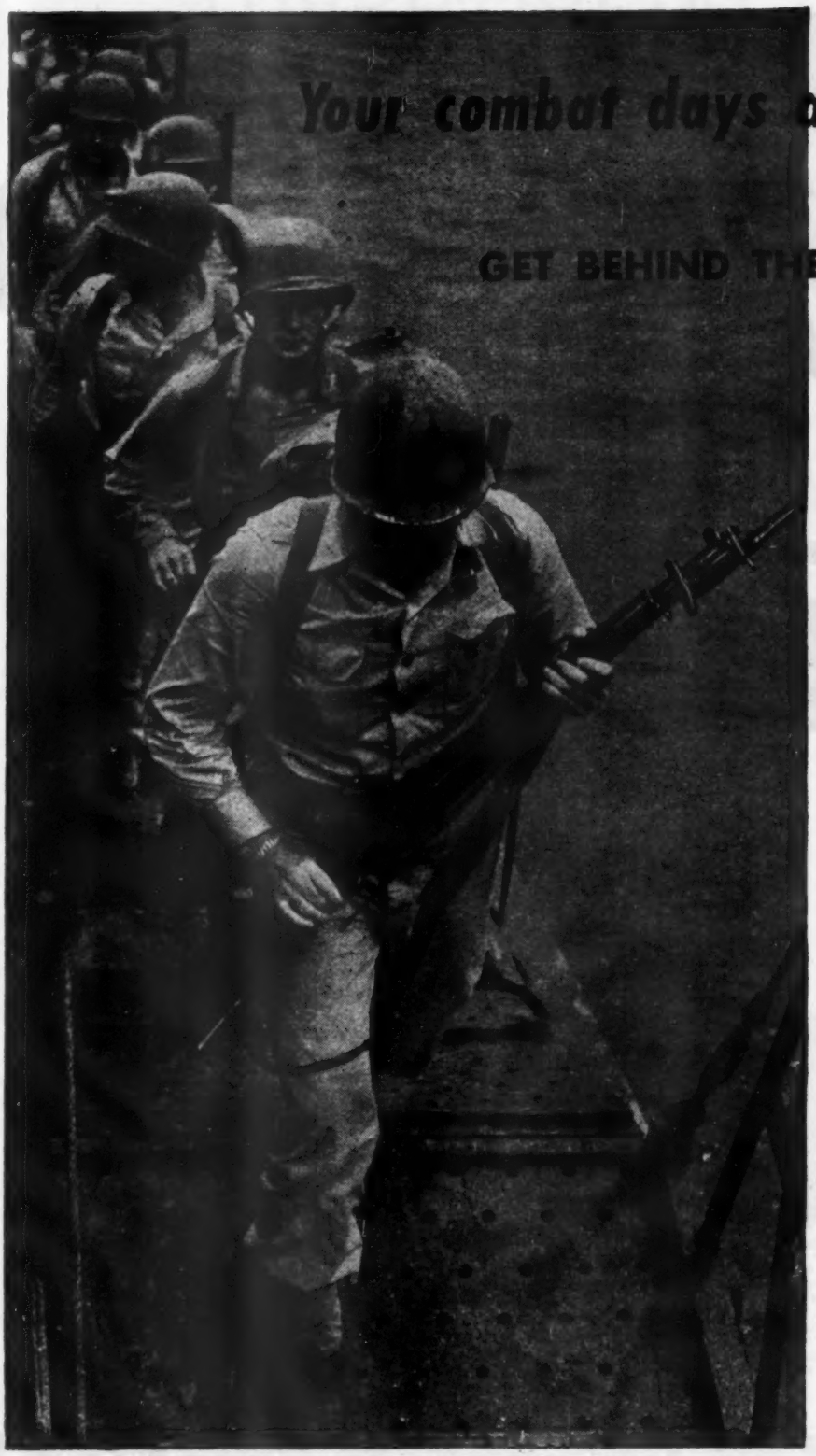

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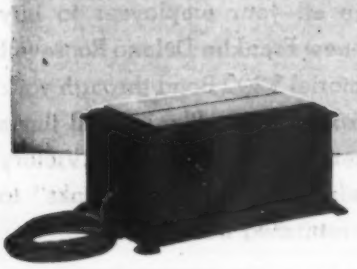

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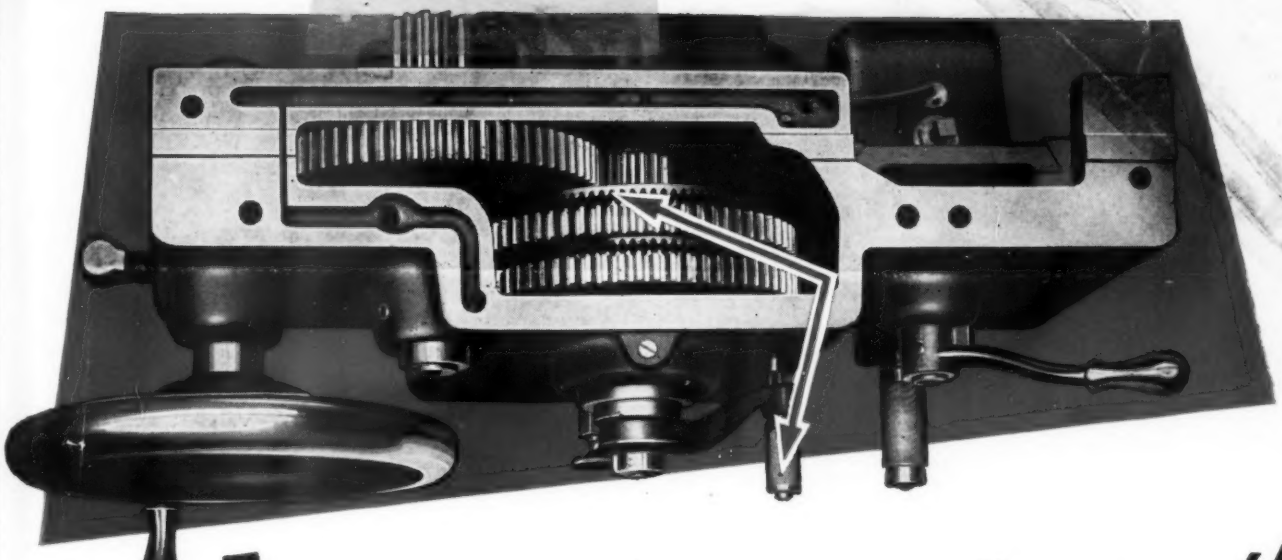

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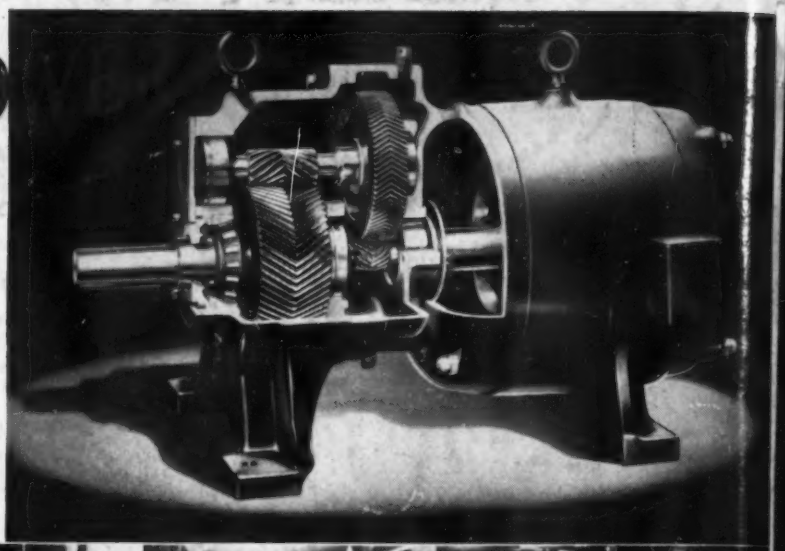

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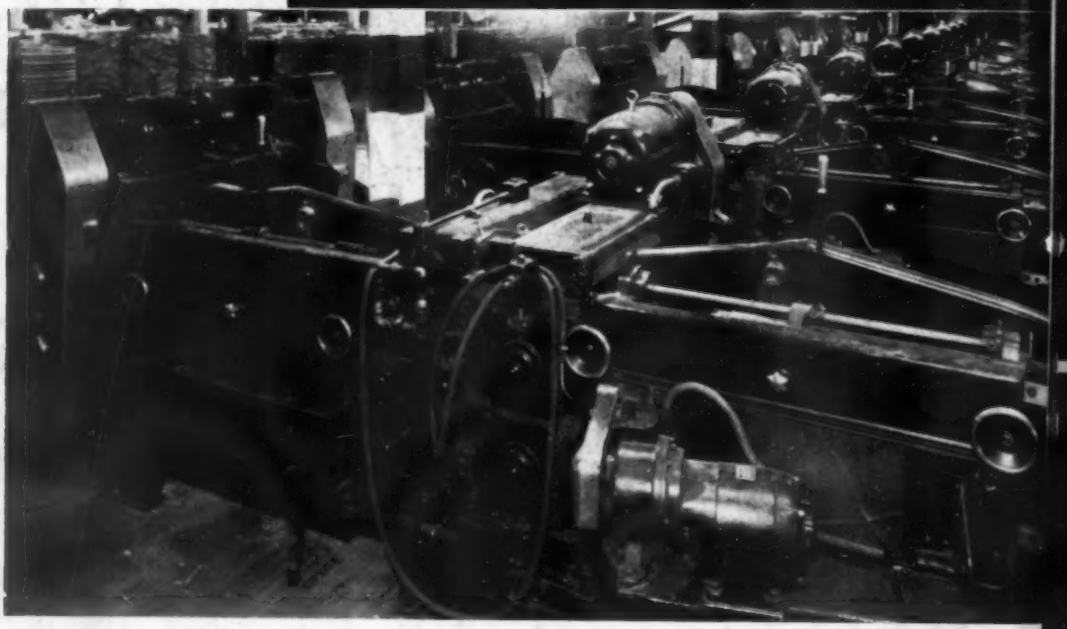
Master Gearhead Motors equipped with Timken Bearings powering tobacco stemming machines.



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